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ABSTRACT

This publication resulted from an investigation by the Government Accounting Office (GAO) into alleged inaccuracies in a National Science Foundation (NSF) report "Pre-college Science Curriculum Activities of the National Science Foundation." Five NSF supported curriculum improvement projects were investigated. Generally, inaccurate and unsupported statements resulted from lack of thorough investigative techniques in determining facts, proper standards for supporting documentation, and/or adequate controls for review and revision of draft case studies according to this GAO report. The question was raised in Congress, and is raised in this document, as to the possible withholding of information and review team findings by NSF. This report concludes that NSF was negligent in responding to congressional concerns about NSF administration of precollege curriculum projects. This report also points out that NSF has implemented most of the recommended administrative changes it has received resulting from this controversy. (MR)

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REPORT OF THE COMPTROLLER GENERAL OF THE UNITED STATES

Curriculum Case Studies Are Of Questionable Quality But Helped Precollege Curriculum Activities

National Science Foundation

Five case studies are a main part of a National Science Foundation report resulting from an ambitious effort to determine within a short time, the adequacy of Foundation procedures and practices. Although the case studies are mostly accurate, they contain many statements that are inaccurate or of questionable accuracy. Generally this resulted from inadequate preparation and quality control standards.

The studies raised many management issues but left out others. Although GAO did not assess the adequacy of agency actions, the Foundation had previously considered all problems GAO found in this review.

The report looks at other questions concerning whether the Foundation's study team attempted to hide some of its findings from public view, and whether the Foundation responded adequately to congressional concerns over possible misrepresentations of peer reviews for one case study.

HRD-77-46

MAY 2, 1977

SE 022 748

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-133183

To the Chairman and the
Ranking Minority Member
Subcommittee on Science, Research,
and Technology
Committee on Science and Technology
House of Representatives

In accordance with the March 19, 1976, request of former Subcommittee Chairman James W. Symington and former Ranking Minority Member Charles A. Mosher, we have (1) reviewed the preparation and accuracy of the five curriculum project case studies contained in the Foundation's May 1975 report "Pre-College Science Curriculum Activities of the National Science Foundation" and (2) determined the completeness of the studies in identifying management problems by using only project records concerning the five projects. The report includes the Foundation's views on our findings, as well as the views of the former Director who requested the Foundation study of its curriculum activities.

Although our report contains no recommendations, we believe it will be of interest to other committees, other Members of Congress, and the public because of the controversy surrounding whether the Foundation's study team accurately and completely reported its findings. We will contact your offices shortly to arrange for release of the report.

Comptroller General
of the United States

REPORT OF THE
COMPTROLLER GENERAL
OF THE UNITED STATES

CURRICULUM CASE STUDIES ARE OF QUESTIONABLE QUALITY BUT HELPED PRECOLLEGE CURRICULUM ACTIVITIES

National Science Foundation

D I G E S T

In early 1975, the Congress and the public expressed concern over new science education courses and programs supported by the National Science Foundation for use by school systems.

The Foundation provided $106 million to academic and nonprofit institutions during 1957-76 for developing science education materials for kindergarten through 12th grade. It provided about $88 million for activities, such as training teachers, to help put the materials to use.

In March 1975, the Chairman, House Committee on Science and Technology asked GAO to review administrative aspects of the Foundation's support of "Man: A Course of Study"--a controversial fifth grade social science curriculum. In April 1975, the Chairman appointed an ad hoc citizen's group to study the Foundation's precollege curriculum activities.

At the same time, the Foundation decided to review its precollege curriculum activities to know, in advance of other reviews, if management problems did exist and to provide information that would be requested by the congressionally appointed group. The Foundation established its review team in April with members selected primarily from its top management and imposed upon itself a May 1975 reporting date--an ambitious effort considering the scope of work and the time allowed. (See pp. 2 and 24.)

Following the issuance of the Foundation's May report--"Pre-College Science Curriculum Activities of the National Science Foundation"--it was learned the report had inaccurately stated results of an evaluation of a proposal

requesting Foundation funds for a curriculum development project. The project was one of five Foundation-financed projects that the review team had used as case studies in evaluating the Foundation's curriculum activities. Questions subsequently arose within the Congress concerning whether the review team's report had been purposely altered to hide the findings on the proposal evaluation from public view. (See p. 3.)

GAO reviewed the five case studies to determine how and why any inaccuracies occurred and if any undisclosed management problems existed. Most of the material contained in the case studies is accurate. However, the case studies contain many statements that are either inaccurate, not adequately supported, or for which no support was available. Also, because the review team members did not systematically compile the supporting documentation for their report, GAO could not be certain what evidence they had considered as acceptable support for a statement. For example, the team members did not assemble the specific documentation used as support for a given statement in the case study. The team members provided GAO with general sources they used, such as the grant folders--which are voluminous--and GAO searched them for documentation that would support statements in the report. (See pp. 5 and 6.)

Generally, inaccurate and other unsupported statements resulted because of a lack of

--thorough investigative techniques in determining facts (see p. 7),

--proper standards for supporting documentation (see p. 8), and/or

--adequate controls for review and revision of draft case studies (see p. 10).

GAO identified many management problems which were either identified in one or more case studies but not in all projects where they existed, or not explicitly mentioned in any case study. However, in the past 2 years five reports were issued, including the review team's, on the Foundation's curriculum activities. The reports contained 75 recommendations for changes in policies and procedures and improved administration. The management problems observed by GAO in reviewing the five case study projects are accounted for in either the 75 formal recommendations or in the Foundation's independent actions. The Foundation has already responded to many of the recommendations; others are under consideration. (See pp. 21 and 23.)

The Foundation's Director wanted the review team's study to be "a model of objective and professional analysis." However, quality controls were not provided to make certain of the study's completeness, accuracy, and reproducibility. GAO believes that lack of these controls, coupled with the short time allowed for completing an ambitious effort, led to the many inaccurate and nonsupported statements as well as failing to detect some management problems. (See p. 24).

Questions were raised about whether a deliberate attempt was made within the Foundation to conceal some of the review team's findings. Only in the preparation of one of the five case studies were changes made that could not reasonably be accounted for. In two other instances in the same case study, statements of problems were revised so as not to reflect the original nature of the findings. (See pp. 34-48.)

Considering that top-level Foundation staff were involved, these events suggest a degree of carelessness in preparing and reviewing the draft case study that could possibly lead to the conclusion that the findings were deliberately withheld from public disclosure. However, considering the review and report were done on a "crash basis," it is possible

Tear Sheet

the omissions might have occurred inadvertently. Sufficient evidence was not available for GAO to decide. (See p. 53.)

During the preparation of the review team's report and after it was issued, Members of Congress questioned the Foundation about whether the reviewers' comments (on the project discussed above) were misrepresented to higher level management officials to gain support for the proposal. According to Foundation officials, in responding to the concerns no attempt was made to check the reviewers' comments to determine whether the allegations were true. The Foundation apparently relied on the summary of reviewers' comments, which contained erroneous data--although it was known by the author of one response that a review team member believed the summary was inaccurate. GAO's conclusion: The Foundation was negligent in responding to the congressional concerns. (See pp. 48 and 55).

The Foundation's Acting Director and its former Director who started the study felt that, notwithstanding the shortcomings identified by GAO, the review team produced a useful report on improvements needed in the Foundation's precollege curriculum development activities. The Foundation's Acting Director acknowledged that more attention should have been paid to establishing appropriate standards and criteria in the review team's effort and that the experience gained will be valuable should the Foundation again undertake rapid analyses of policies and procedures. (See pp. 23, 33, 55, 69, and 71.)

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ABBREVIATIONS

CHEM Study	Chemical Education Materials Study
CPE	Comparing Political Experiences
GAO	General Accounting Office
ISIS	Individualized Science Instructional System
MACOS	Man: A Course of Study
SCIS	Science Curriculum Improvement Study

CHAPTER 1

INTRODUCTION

The National Science Foundation is authorized to initiate and support basic scientific research and programs which strengthen scientific research potential and science education programs. The Foundation is granted authority under the National Science Foundation Act of 1950, as amended, (42 U.S.C. 1861 et seq. (Supp. V, 1975)) and operates through grants and other forms of assistance such as contracts.

The Foundation's science education activities, administered by its science education directorate, consist primarily of grant and fellowship programs to improve education for professional careers in science and technology fields, improve scientific literacy, and increase the efficiency and effectiveness of educational processes. Over the last 20 years (fiscal years 1957-76) Federal funds of about $1.7 billion have been spent for these activities. As part of the activities, Foundation officials estimated that during fiscal years 1957-76 the Foundation awarded about $106 million to universities and other nonprofit institutions for 54 precollege curriculum development projects. These projects produced a variety of education materials and processes for use by school systems in kindergarten through 12th grade. Foundation officials also estimated that grants for implementing the precollege level projects (such as training teachers to use new materials) totaled over $87.9 million for fiscal years 1958-75. 1/

In early 1975 some Members of Congress and the public expressed concern over Foundation support of innovative curriculum development and implementation. The concern centered around a fifth grade social science curriculum called "Man: A Course of Study" (MACOS). Some believed the curriculum was inappropriate for its intended use because it was value-laden and in some instances was too graphically illustrated. For example, one film scene of the slaughter of a seal was felt to be too gory for fifth grade children.

1/ Congress curtailed Foundation precollege implementation activities for fiscal year 1976 and the Foundation has no plans to request funds for implementation programs, as in prior years, that would assist teachers and administrators in adopting or using Foundation-funded or non-Foundation-funded curriculums.

Also, some believed that the Foundation's involvement with implementing the project was tantamount to subsidizing MACOS' commercial distributor to the detriment of distributors of non-Foundation-supported curriculums. Also, charges were made that a special relationship existed among the MACOS grantee, the publisher, and the Foundation.

Pursuant to a March 13, 1975, request of the Chairman, House Committee on Science and Technology, and subsequent agreements with his office, we reviewed and reported on aspects of the development, implementation, and evaluation of the MACOS project, as well as on the relationship between the developer and the publisher. 1/ Also, on April 22, 1975, the Chairman, House Committee on Science and Technology, appointed an 8-member group of educators, executives, and private citizens to study the Foundation's curriculum implementation policies, with particular emphasis on MACOS. 2/

According to the Foundation's Director, 3/ during the controversy surrounding Foundation-supported curriculums and Foundation practices, the National Science Board 4/ questioned whether Foundation practices were adequate. Also, the Foundation learned that the Chairman, House Committee on Science and Technology, was planning to appoint an ad hoc committee to review Foundation support of curriculum programs. It was then decided, in consultation with the Board, that the Foundation would conduct its own review of the precollege curriculum development activities.

The Foundation's review was to generally investigate precollege activities such as (1) curriculum development

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1/ "Administration of the Science Education Project 'Man: A Course of Study' (MACOS)" (Oct. 14, 1975, MWD-76-26).

2/ Their review resulted in majority and minority reports dated October 1 and October 20, 1975, respectively. The reports are available from the House Committee on Science and Technology.

3/ Dr. H. Guyford Stever was the Foundation's Director from February 1972 to August 1976, during which time the precollege curriculum review activities discussed in this report took place. Unless otherwise noted, all references to the Foundation's Director are to Dr. Stever.

4/ The National Science Board consists of 24 members appointed by the President, with the advice and consent of the Senate, and of the Foundation's Director ex officio. The Board establishes the policies of the Foundation.

history, (2) curriculum distribution policy and royalty arrangements, (3) curriculum implementation procedures, (4) procedures for evaluating course content and utilization, and (5) practices and procedures for curriculum development supported by other organizations. Also to be included were five detailed case studies of precollege curriculum projects supported by the Foundation to see what they illustrated about the Foundation's procedures for supporting curriculum development. The projects selected were: MACOS, Individualized Science Instructional System (ISIS), Chemical Education Materials Study (CHEM Study), Science Curriculum Improvement Study (SCIS), and Comparing Political Experiences (CPE). They were chosen to represent projects in different disciplines and stages of completion. See appendix I for a description of the projects.

The Foundation's report, dated May 1975, is in two volumes. Volume I contains summary discussions of review results and recommendations. Volume II contains detailed discussions of the topics covered in the review, including the five case studies. In addition, a number of administrative recommendations were made in an internal memorandum that was separate from the report.

After the Foundation's report was issued, the Chairman, Subcommittee on Science, Research, and Technology, House Committee on Science and Technology, requested we examine the accuracy and completeness of summarized peer review comments in a Foundation program staff memorandum that was used in recommending Foundation support of what became the ISIS project. We reported to the Chairman that the Foundation's summarizing techniques were questionable because (1) some of the quoted reviewers' comments could be considered taken out of context and (2) the summary memorandum stated all reviewers had recommended funding which, in fact, could not be justified for three. 1/

A comparison of our January 1976 review to the Foundation's published ISIS case study showed that the Foundation's review team inaccurately reported that all reviewers recommended funding for the initial ISIS proposal. During congressional hearings which followed our January 1976 review, charges were levied that the review team had found misuse of ISIS peer reviewer comments, but team leaders had purposely deleted this finding from the report. In

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1/ "Representation of Peer Review Comments for the National Science Foundation's 'Individualized Science Instructional System' Project" (Jan. 12, 1976, MWD-76-78).

addition, the Foundation's Director, in a February 5, 1976, letter to the Chairman of the Subcommittee on Science, Research, and Technology, stated that, on further examination of the case studies and other grant projects, additional problems with the Foundation's science education administrative practices were apparent.

The Subcommittee chairman and ranking minority member felt an independent assessment was needed to investigate the issues involved. In accordance with their March 19, 1976, letter and subsequent agreements with the Subcommittee office, we were requested to (1) review the preparation of the five case studies contained in volume II of the report and the synopses of those case studies in volume I to determine how and why mistakes developed and (2) determine if further improvements were needed in the Foundation's precollege curriculum activities.

LIMITATIONS OF OUR REVIEW

To determine the accuracy of statements in the five case studies, we used the same materials available to review team members, as identified by them, during their review. The grant files maintained by the program office, which are the Foundation's official records for the projects, were the primary records for the review. Normally, our review of the administration of a Foundation program would entail a review of records at both the Foundation and the project headquarters, as well as discussions with Foundation staff, project staff, and other interested parties, such as users of educational curriculums. However, to assess the completeness of the case studies' recognition of management issues, we relied on sources the review team indicated they had relied upon. The scope of our review is discussed further in chapter 5.

RELATED REPORT

In addition to the previously mentioned reports on the Foundation's science education curriculum activities, our report entitled "National Science Foundation-Supported Science Education Materials: Problems in Evaluation, Distribution, and Monitoring," (HRD-76-134, October 20, 1976), contains a number of recommendations for improving the Foundation's practices and procedures for (1) monitoring the development of projects it supports, (2) providing for sound evaluations of the projects' curriculum materials, and (3) considering potential distribution problems early in the development stage of the materials. The report was a followon to our October 14, 1975, report on MACOS (MWD-76-26) and considered nine additional Foundation-supported science education projects.

CHAPTER 2

HOW ACCURATE AND COMPLETE ARE THE FIVE CASE STUDIES?

Most of the material contained in the case studies is accurate. However, the case studies do contain many statements that are either inaccurate, not adequately supported, or for which we could not find support.

The case studies do not explicitly discuss many of the management problems we noted; however, problems were addressed by (1) the recommendations in the review team's report, (2) other reviews of the Foundation curriculum activities conducted by us and by a congressionally appointed citizens committee, or (3) Foundation action apparently independent of the review team's recommendations.

PROBLEMS WITH THE CASE STUDIES' ACCURACY

The team members did not systematically compile all the documentation they used, and they did not prepare workpapers or otherwise indicate specific support for a given statement in a case study. We interviewed the case study team members to determine generally what documentation they relied upon, and then reviewed that material to find support for the statement. If we could not find adequate (or any) support for the statement, we reinterviewed team members more specifically about documentation they had used.

Most of the material contained in the case studies is accurate. However, because the team members did not systematically compile the documentation used to support their case studies, we cannot be certain what degree of evidence was accepted by the team members as adequate support.

There are statements 1/ in each case study which are not correct or cannot be adequately documented from the

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1/ The term "statements is generally defined to include any item, from an incorrect date to a phrase to whole paragraphs, which we questioned.

records used by the review team. 1/ Also, there are statements in each case study for which we could not find any support. 2/ The total number of statements which we questioned averaged about three examples per page in one case study, six items per page in a second case study, seven items per page in a third case study, and nine items per page in a fourth case study. However, since the case studies are mainly descriptive histories of the projects, most of these statements do not relate how well the Foundation administered the grants. In the fifth case study the author apparently relied heavily on a review performed by an outside party, and we could not verify much of the material from source documents available to us. About 60 percent of that published case study can be directly identified with the outside party's review.

Generally, we believe these problems with statements arose because of a lack of (1) thorough investigative techniques in determining facts to be used in the case study, (2) proper standards for supporting documentation, and/or (3) adequate controls for review and revision of draft case studies. To illustrate the kinds of problems we found, two examples of each are discussed below. The Science Curriculum Improvement Study and Chemical Education Materials Study case studies are also discussed below because of the somewhat unique problems they presented.

1/ A statement which we did not believe was correct or adequately supported is one for which

--the source or other adequate documentation indicates that the statement was incorrect, such as a wrong date or a summary statement on peer reviews not supported by an analysis of the original reviews, and/or

--the statement appears to be based on a questionable source, such as unsigned, undated handwritten margin notations, or a draft document, and/or

--a statement which gives a misleading impression, such as transposing two events or leaving out important relevant details.

2/ A statement for which we could find no support is one for which source or summary documentation could not be provided by the author to indicate whether the statement was either true or false.

Examples of questionable investigative techniques

The following is a statement, for which we could find no support, that was used in the CHEM Study case study as an example of the project's success.

> "* * *The minimal persistent use [of CHEM Study materials] is estimated to be on the order of 25 percent of all high school students. The CHEM Study materials, including revised versions and derivations, runs well over 60 percent usage." (Vol. II, p. 71)

The case study author told us that somewhere she saw an estimate of 1970 CHEM Study usage to be 37 percent, so she guessed that 1975 usage would be about 25 percent. In computing the 60 percent figure, the author advised us that 10 new chemistry texts were introduced between 1963 and 1968, 7 of which reflected the influence of CHEM Study and another Foundation-supported project, the Chemical Bond Approach project. She reasoned that because 7 texts were influenced out of the 10 introduced, usage would be 70 percent, and if the Chemical Bond Approach project was discounted, which she estimated to be 10 percent, then use of CHEM Study materials and materials derived from CHEM Study would be 60 percent.

The published SCIS case study states in a section called "Monitoring History":

> "In 1969 NSF [National Science Foundation] engaged three consultants to perform a substantive review of SCIS materials and procedures. The results of this review were used to provide critical input to the SCIS project director." (Vol. II, p. 87)

Early case study drafts did not contain this paragraph, and actually the author was quite critical of the Foundation's monitoring of the SCIS project. Our review of grant records, including a separate file on the substantive review referred to in the quote, showed that only one of the three consultants (reviewers) completed and sent his review to the Foundation, which then sent it to the project director. The files indicated that the two other reviewers carried out some evaluation activities but never completed their review or filed reports. There is no indication they provided the results of their review to the project director. The above quote from the case study apparently resulted from comments on a draft

version of the case study which were accepted without verifying the accuracy of the comments, as discussed below.

A science education directorate official, acting as a resource person for the study team, reviewed the critical version of the draft case study and wrote in the margin:

> "* * *What about the site visits by NSF staff, site visits by proposal reviewers, and finally the substantive review by [3 names deleted] in 1969. This substantive review of the materials also included on-site visit to trial centers and classrooms by the 3 aforementioned.* * *"

According to the science education resource person, he met with the case study author and an editorial consultant to discuss his comments on the SCIS draft. His marginal comments on the draft indicate that he felt that some criticism of the Foundation's monitoring of the SCIS project was warranted, but he questioned the severity of the report's conclusion about monitoring. In commenting on the review by three consultants, the resource person believed he had supplied the case study author with a program memorandum recommending support for a substantive review by the three persons. He did not recall if he pointed out during the discussion with the case study author that two of the reviewers apparently had not filed reports.

The case study author said he prepared the above quoted case study statement as a result of the meeting with the resource person, and forwarded the statement to the editorial consultant for inclusion with his draft. Because of deadlines, the author said he relied solely on the material provided him and did not read the separate grant file containing substantive evaluation information.

Examples of poor documentation standards

The CHEM Study case study states in a discussion of films produced for the CHEM Study project:

> "* * *These contracts, for the production of films only, cost from $11,500 to $21,650 each.* * *" (Vol. II, p. 72)

According to a grantee publication, the CHEM Study project produced 27 student-oriented films, 17 teacher training

films, 2 films for information dissemination, several short film loops, and filmstrips based on motion pictures. The Foundation's files contained only the contracts for four student-oriented films, and the files do not document the exact number of contracts awarded for film production. The review team member who wrote the part of the case study dealing with film production said that he had reviewed seven or eight contracts and that an education directorate official had advised him the costs were representative. The case study gives the impression that each of the contracts fell within the stated range. We believe the statement should have been qualified.

The Comparing Political Experiences case study contains the statement:

> "Presently there are twenty-five pilot schools using the course materials. There are also fifty affiliate schools which receive the materials but are only informally involved in the pilot testing, i.e., the schools are free to use the material and may or may not provide feedback to the Project Director." (Vol. II, p. 90)

We could not find support for involvement in the pilot testing of the 50 affiliate schools. The review team's records contain a memorandum of discussion among the case study author, the project director, and a member of the grantee institution with which the project director was affiliated. The memorandum refers to 25 pilot schools using the material and an "uncounted number of affiliate schools" each receiving one copy of the material.

The case study author believed the number 50 was obtained in this interview but might not have been included when he transcribed his interview notes. However, he stated that when he was writing the case study narrative he could have remembered that the number 50 was mentioned during the interview and included it in the case study at that time. We believe it is acceptable to obtain data of this type orally from appropriate sources; however, it should be recorded in workpapers and if other documentation is not available to corroborate the statement or otherwise establish its accuracy, it should be qualified as to its source.

Examples of errors possibly resulting from poor control of drafts during review and revision

The MACOS case study contains several examples of errors that can be found from reading the case study. For example, in table 1 of the study, a footnote was omitted (only the footnote number appears), and the sums of the amounts requested by the grantee and the amounts awarded by the Foundation do not add up to the respective totals contained in the table. On a later page, the date of amendment 8 to the grant is shown as June 29, 1963, but a prior table shows the initial grant award date as November 5, 1963, followed by seven amendments. Table 4 lists the evaluation by 12 peer reviewers of a grant proposal according to affiliation, discipline, and recommendation, but the total at the bottom of the page indicates that 19 reviews were obtained. Table 1 shows development funds awarded in fiscal years 1969 and 1970, which table 3, on funds awarded for development, omits.

The Individualized Science Instructional System case study contains an example in which a statement correctly contained in drafts was included incorrectly in the published case study. Also, a valid management issue contained in the draft case study did not appear in the published case study. These ISIS examples are discussed in detail in chapter 4 because of the controversy one example caused.

Much of the SCIS case study is comparable to another report

Large amounts of the SCIS case study are identical to or contain only minor editorial changes to a uncopyrighted 1971 report on SCIS by the American Institutes for Research in the Behavioral Sciences, prepared for the Office of Education, Department of Health, Education, and Welfare. 1/ Of the approximately 650 narrative lines contained in the case study, about 400, or about 60 percent, are either verbatim or differ only in minor editorial changes from the Institutes' report.

1/ American Institutes for Research in the Behavioral Sciences, Science Curriculum Improvement Study, Palo Alto: 1971. This report is one of a series dealing with the development history of recent education products. The report is based on published materials, project files, and interviews with project staff. Chapter headings include product description, project origins, product development, summative evaluation, diffusion procedures, and adoption by users.

The case study gives no credit for material used from the Institutes' report.

The case study author advised us that he had used the Institutes' report to help him prepare sections of the case study and that it provided him with much historical data in one place that otherwise had to be compiled from the grant files. He also said that while much of the wording in the case study is similar to that in the Institutes' report, it was quite possible he had gotten some of the wording elsewhere since many of the documents available for his use were undoubtedly available to the Institutes during its study. The author did not verify all the information contained in the Institutes' report because he understood that secondary source material could be used, and he had no reason to question the accuracy of the Institutes' report.

We attempted to check those items that were essentially the same in both the Institutes' report and the case study using grant files and other documents available to the case study author. Of the about 400 narrative lines, we could verify only about 45 percent of this material, with the remainder either contradicted by source documentation in the grant files (about 8 percent) or not contained in the material we reviewed (about 47 percent).

The CHEM Study case study could have been written more objectively

The case study praised the CHEM Study project, the project staff, and Foundation administration of the grant. However, some statements extolling the project, staff, or the Foundation either gave a misleading view of occurrences, were inaccurate, or the author could not provide adequate support. Several examples from the case study and our analysis of the documented records from the grant files and other material we reviewed follow.

The following paragraphs from the case study describes the receipt and review of the proposal that led to the initial CHEM Study award:

> "A formal proposal of this plan [for curriculum revision] was submitted to NSF for review. It received enthusiastic endorsement both from NSF staff and most external reviewers. Suggestions for revision were also received. NSF believed the revisions should be made and forwarded a commentary to * * *

"[the project chairman named in the proposal]. The changes were incorporated and following review by the Chairman and Vice-Chairman of the National Science Board an award to initiate the curriculum development was made. Subsequent amendments in excess of $250,000 were reviewed by the full Board prior to the award.

"In view of the interrelationships of NSF staff, ACS [American Chemical Society] membersip [sic] and the participants in the CHEM Study Project, suggestions of elitism, or the operation of a 'buddy system,' etc. might have been raised concerning the award of the grant, however:

". NSF was committed to selecting the best professional help it could find in initiating the effort, and it did so.

". The major professional society in the field was equally concerned with and actively participated in improving curricula.

". The NSF reviewers and advisors, and major participants on the grant were acknowledged experts and individuals who exemplified the highest professional standards and integrity.

". The participation of these individuals was an act of service to scientific education. Salaried personnel were compensated at a no-loss, no-gain basis with respect to former jobs. None of the participants received royalty income; this was remitted to the U.S. Treasury (except for $463,654 used by NSF) and in amounts which exceeded the original amounts awarded. Furthermore, the texts that were published do not carry the authors' names." (Vol. II, p. 70)

Neither the paragraphs nor the remainder of the case study reveal that of the 11 external reviewers of the proposal, one was listed in a draft proposal as a proposed planning group member and his review noted that he had agreed to be a project writing group member. Another reviewer was listed as a project advisory group member. Two other

reviewers were members of a needs assessment conference, 1/ and a fifth reviewer was affiliated with the planning grants that gave rise to the CHEM Study proposal. One of those reviewers wrote:

> "You know perfectly well I enthusiastically approve the proposal * * *. Having been a member of the ad hoc committee which originally got this thing started, you could hardly expect me to do otherwise."

While peer reviewers who participate in the needs assessment or the planning activities can provide valuable insight into the proposal's merits, it is questionable whether the initial CHEM Study proposal received a broad representative review when 5 of the 11 reviewers had some involvement or affiliation with the planned curriculum revision. The memorandum recommending support for the proposal made no mention of these affiliations when summarizing the results of the peer review. 2/

With regard to the suggestions for revision made and transmitted to the project chairman, we could find evidence that only one of the five revisions suggested by the reviewers and one other suggestion were forwarded.

Regarding the "review" by the Board's Chairman and Vice Chairman, we could find no evidence that the Vice Chairman reviewed the award recommendation. The Chairman's "review" apparently consisted of a telephone call from the then Foundation Director who felt that the Board should be aware of the proposed award because it was expected to eventually exceed the dollar limit that the Director could award without the Board's approval. The case study author said she assumed the Chairman and Vice Chairman saw a package with supporting proposal records. She noted that the Board may see grant records anytime and that the term "review" could have several connotations.

1/ This conference perceived the need for chemistry course revisions that led to the planning grants for the CHEM Study proposal.

2/ The project writing group member's review was received after the memorandum was written, although his review was considered in the award decision.

With regard to the author's four refutations that suggestions of a "buddy system" might have been raised:

--While the case study author provided us with general Foundation documents, such as its annual report, that the purpose of the Foundation's course content improvement program was to "engage the Nation's finest talent," one would not expect the Foundation to allow a grantee to rely on second-rate staff.

--"The major professional society" in conjunction with the Foundation determined the need for a chemistry course revision that led to the CHEM Study proposal.

--The Foundation should not be expected to rely on persons who do not exemplify high professional standards and integrity.

--Persons who worked on CHEM Study as "an act of service to scientific education" were in no different position than any other grantee or person preparing improved materials. All must forego other activities--such as research--in order to write new texts or other materials. Regarding salaries, an official from the Foundation's grants and contracts office advised us that it has always been Foundation policy to recompense salaries of professionals at the same level they receive from their institution and believed the Foundation has never permitted professional staff from academic institutions to retain royalty income generated from sale of curriculum materials developed under a Foundation grant. Finally, the texts do carry the authors' names--although the case study author advised us she intended the passage to mean that the text was not commonly known by any individual's name.

The effect of the statements appears to be largely self-serving. Nowhere is it demonstrated that activities carried out by the project participants differ in form or in substance from those expected of other Foundation grantees.

The implementation history section of the case study opens with the statement:

"It was determined early that materials produced should be competitive with current texts and that the packaging should be flexible in order to allow

"selective utilization and easy adaptation of both equipment and supplementary materials.* * *" (Vol. II, p. 74)

Both of these conditions would be desirable to make certain that the proposed materials would be acceptable to intended users. While we could find evidence that there was a conscious decision to make the materials flexible for use under varied local conditions, we could find no evidence that there was an early determination that the materials should be competitive with existing texts, even though the author suggested references to support this statement. For example, one suggested source was a history of the project entitled, "The CHEM Study Story," which seems to refute the case study statement:

"* * *First, the Study felt that its goal of improving the teaching of high school chemistry could best be served if the course materials were published in the exact form decided upon by the Study, without being influenced by how popular the books might be. Thus, while it was intended that the CHEM Study materials be appropriate for use by most students who normally take high school chemistry, no attempt was made to make the book 'all things to all teachers.' Instead, it was hoped that the materials would serve as a model to be considered by other authors and publishers in developing new materials."

As an example of the project's success, the following was stated:

"5. The materials were widely and quickly adopted in U.S. high schools and their use persists to the present. Some states have adopted parts as "required"; others as "optional." The minimal persistent use is estimated to be on the order of 25 percent of all high school students. The CHEM Study materials, including revised versions and derivations, runs well over 60 percent usage." (Vol. II, p. 71)

As discussed on page 7, the estimated use was a guess by the case study author.

Case study synopses

We reviewed the case study synopses contained in volume I of the report for accuracy. One of the review team's consultants advised us she wrote the synopses from the draft case studies. The synopses, in most instances, were consistent with the published case studies.

CASE STUDIES RAISED MANY MANAGEMENT ISSUES BUT LEFT OUT OTHERS

To determine the completeness of the case studies in identifying management issues, we reviewed the grant files and other materials available to the team. The case studies noted many areas which needed improvement, such as

--more formal needs assessments,

--improved external review procedures,

--need for more user involvement,

--closer project monitoring by Foundation staff,

--improved product evaluation, and

--more concern for curriculum marketing problems.

The following table summarizes (1) the management problems we found in the Foundation's administration of the five precollege curriculum development projects the review team used as case studies, (2) whether the review team's case studies identified the problems, and (3) whether recommmendations made by the review team or others addressed the problems.

Problem Area	Case Study (note a) CHEM Study	SCIS	CPE	MACOS	ISIS	Recommendations made by
Need for more formal and systematic needs assessments	G	C,G	C,G	C,G	C,G	Foundation's review team Congressionally appointed ad hoc review group GAO (Oct. 14, 1975, report on MACOS)
External review procedures:						
Potential curriculum users not included (such as teachers)	G	C,G	N/P	C,G	G	Foundation's review team Congressionally appointed ad hoc review group GAO (Oct. 14, 1975, report on MACOS)
Reason for selection not documented (to insure representative viewpoints)	G	C,G	C,G	G	G	Foundation's review team
Disposition of review comments not noted (to insure consideration)	G	G	G	G	G	GAO (Oct. 14, 1975, report on MACOS)
Proposal revision; change in grant objectives:						
Proposal revised but not documented (for accountability)	N/P	G	G	N/P	N/P	None, but subsequent action taken, see pp. 21 and 66
Major decisions affect grant but not documented (for accountability)	G	N/P	G	G	G	None, but subsequent action taken, see pp. 21 and 66
Initial and renewal award recommendation:						
Peer reviewer comments inaccurately summarized in program recommendation	N/P	G	G	G	G	Foundation's review team
Monitoring development work:						
Problems resulting from hands-off monitoring approach (other than below)	N/P	C	C,G	C,G	N/P	Foundation's review team Congressionally appointed ad hoc review group GAO (Oct. 20, 1976, report on 10 curriculum projects)
Little evidence of Foundation monitoring of materials' evaluation (to insure sound materials' evaluations)	G	G	G	C,G	G	Foundation's review team Congressionally appointed ad hoc review group GAO (Oct. 20, 1976, report on 10 curriculum projects)
Little evidence of Foundation concern about potential marketing problems (to forestall potential problems)	N/P	C,G	G	G	N/P	GAO (Oct. 20, 1976, report on 10 curriculum projects)
Distributor selection and approval:						
No prior approval of selection criteria (to insure grantee's criteria are adequate)	G	G	(b)	G	G	None, but subsequent action taken, see pp. 21 and 68
No approval of contracts, subcontracts before execution (to protect Government's interest)	G	G	(b)	C,G	N/P	Foundation's review team GAO (Oct. 14, 1975, report on MACOS)
Inadequate rationale/documentation for distributor selection (to insure best choice)	N/P	N/P	(b)	G	G	GAO (Oct. 14, 1975, report on MACOS)
Questionable relationship of grantee and distributor	C,G	N/P	(b)	N/P	N/P	None, but subsequent action taken, see p. 20

a/ G - problem observed by GAO during this review
C - case studies mentioned problem
N/P - no problem observed by us and the case study did not mention it.

b/The grantee had not formally solicited distributors as of July 1975 when the review team's report was published.

Many problems were not addressed by case studies

As shown in the above table the case studies did not specifically identify many of the problems we observed. Those problems included those identified in one or more case studies but not identified in all projects where they existed, such as little emphasis on materials' evaluation, as well as problems the review team did not mention in any particular case study, such as compliance with Foundation policies on the selection and approval of curriculum distributors. Case study review team members discussed why problems that we noted were not mentioned in the case study. Generally, their responses fell into three categories:

--They did not agree with our conclusion. For example, one review team member felt that documenting the disposition of peer reviews to insure that all comments are considered and adequately disposed of was unnecessary.

--They felt the specific problem we raised was part of a broader problem. For example, if the case study did not explicitly address the problem of the need for improved product evaluation by grantees we were advised that this matter would have been considered as monitoring in general.

--They did not look for the problem, such as the need for the Foundation to insure that grantees will consider potential marketability problems while the product is being planned and developed.

In addition, some team members advised us that some issues were not included in the case study if they knew the issue would be addressed in other case studies or in the report recommendations, or if the issues were consistent with practices and procedures at the time.

The omission of management problems from the case studies does reflect on the quality of the review team's report. However, as shown in the above table regarding corrective action recommended to the agency, this omission has had little practical effect. The review of five different projects simultaneously served as a safeguard--problems which were not addressed in one case study were addressed in another. Also, concurrent and later review of the Foundation's program addressed some problems that none of the five case studies specifically

addressed. Third, apparently independent of the results of its review, the Foundation has addressed problems which we identified but which were not observed by the review team.

Credibility of findings could have been improved

The published case studies are for the most part a descriptive history of the projects. At the end of each case study is a section on problems the authors found in their detailed review of the project. However, there is sufficient data for only about 60 percent of the problems discussed at the end of the case studies--either in the body of the case study or in the statement of the problem--to determine the nature of the problem and its cause. For example, the ISIS case study questions what material other than the proposal should be provided to peer reviewers. It was not stated in the case study, or in the description of the problem, that the case study author's point was that none of the reviewers were provided with the needs assessment report that gave rise to the proposal. However, two case studies prepared primarily by one author accounted for most of the instances where we could not determine from reading the case study why the problem occurred.

The administrative recommendations--those recommendations generated by the review team but not included in the report--also often did not identify or refer to a problem, which could result in possible misunderstandings about the problems. The review team's executive secretary advised us that because the review team would not have picked out all administrative problems on specific cases, it was his expectation that these general recommendations would stimulate the education directorate to examine all of its curriculum development projects.

We believe development of the problems would have enhanced the credibility of the case study findings and the administrative recommendations.

The Foundation had no formal procedure to address review team findings

According to a Foundation official, no formal or systematic means were employed to insure that all problems addressed in the five case studies were evaluated and acted on. While most of those problems can be matched to a review team recommendation, recommendations from subsequent reports, or corrective action taken by the agency, we noted 11 problems

raised in the case studies which did not appear to be addressed by the review team's recommendations. These included a wide variety of issues such as establishing policies to deal with potential conflict-of-interest situations involving project participants and whether grantees should be required to appoint oversight committees to monitor project activities and provide advice. In each case, although we did not assess the adequacy of those actions, either we noted subsequent Foundation actions which addressed the problem or the Foundation advised us of new policies, procedures, and practices which covered the problem.

THE FOUNDATION HAS ACTIVELY RESPONDED TO RECENT RECOMMENDATIONS

In the past 2 years the Foundation's precollege curriculum development and implementation programs have been subjected to much congressional and public scrutiny. Five reports, four of which were in response to that scrutiny, have been issued during this time, and many wide-ranging (and often overlapping) recommendations--there were 75--for improved administration of these activities have been made. The recommendations addressed policy issues, needed changes in procedures, and improvements in current practices. Some addressed certain aspects of a single project. The Foundation has actively responded to many of these recommendations by reviewing its development and implementation programs, by examining its practices to make certain that sound business practices are followed, and by instituting new procedures. Some agency actions on recommendations have been implemented and some are still being considered. Several of the major actions are discussed in appendix II.

CONCLUSIONS

Based on our review of the documented record the five case studies contained in volume II of the Foundation's report are of questionable quality and are not reliable as historical documents. Each case study contained (1) numerous inaccuracies, (2) statements which are not adequately documented from records used by the team, and (3) statements for which we could find no support. Some of these involved management issues, though most did not. One case study apparently relied heavily on a third party report for source material. This is an unacceptable practice for what was to be a model of objective and professional internal analysis of Foundation programs. Also, the CHEM Study case study praised the project with some statements about the project,

the staff, or the Foundation which were either inaccurate, gave a misleading impression, or could not be supported. Our review of the case study and the documented record shows that if the case study were written more objectively, it could have been more critical.

We believe these problems generally were a result of a lack of (1) thorough investigative techniques in determining facts to be used in the case study, (2) proper standards for supporting documentation, and/or (3) adequate controls for review and revision of draft case studies. The case study synopses contained in Volume I of the report, in most cases, repeat the statements made in the case studies themselves.

Many of the management problems we noted from reviewing the five projects were not described in the case studies or addressed in recommendations stemming from the Foundation's review. Because we relied on the same material the review team used, we believe the case studies and the report itself are therefore incomplete. Some team members advised us that problems they found were not included in the case studies because they were to review the project in context with the practices and procedures at the time, or because they were aware the specific problem would be addressed in other case studies or the report recommendations. We believe that issues that would lead to improved program administration should be identified regardless of whether the actions were consistent with practices and procedures at the time. Also, contrary to review team assertions, identical problems were reported in several case studies. This nonrecognition of problems because they were to be mentioned in another part of the report would not allow the study team to determine the severity of the problem by one good indicator, the frequency of occurrence.

The fact that problems identified in case studies were not always reported apparently had little effect because all the problems we noted that were not addressed by the Foundation's review were either addressed by another concurrent or subsequent review by others, or the Foundation apparently has acted independently to remedy the problem. Thus, from our limited review we have no new recommendations for improving the Foundation's administration of its precollege curriculum development program.

Some of the problems raised in the case studies and some recommendations resulting from the Foundation's review were not explicitly developed. In these cases the nature of the

problems was not clear. To effectively address the problems noted and to enhance the credibility of recommendations, the review team's report should have developed those issues in its report.

It is apparent that the Foundation has acted to address problems raised by the review team and others. And, it apparently has acted on its own to address other issues we noted. While we have not attempted to assess the adequacy of the changes in the Foundation's administration of its curriculum activities, the Foundation has actively and positively responded to recommendations to improve its curriculum activities.

AGENCY COMMENTS

By letters dated March 3, 1977, and March 4, 1977, (see app. III and IV), the Foundation's Acting Director and its former Director advised us that, notwithstanding the shortcomings identified by us, the review team produced a useful report on needed improvements in the Foundation's precollege curriculum development activities.

While we agree that the review team produced a useful report, it should also be noted that four other non-Foundation reports and apparently independent Foundation actions followed it which addressed some of the same issues and other issues not reported by the review team.

CHAPTER 3

REPORT WAS PREPARED IN A CRISIS ATMOSPHERE WITHOUT EFFECTIVE QUALITY CONTROLS

The controversy surrounding the Foundation-supported MACOS project and the designation of a congressionally appointed ad hoc group to review the Foundation's precollege curriculum activities induced the Foundation to review its own activities by establishing a science curriculum review team. The scope of the Foundation's study was ambitious and the time to complete the study was short. In addition, there was a lack of formal controls to insure the quality of the Foundation's report. We believe these factors were primarily responsible for the kinds of problems discussed in chapter 2.

SCOPE OF REVIEW TEAM'S EFFORT

The Foundation's Director established an ambitious plan for review of the precollege program which included the five case study projects. The Director, in an April 1, 1975, letter to the Chairman, House Committee on Science and Technology, assigned the following responsibility to the review team:

> "In my NSF [National Science Foundation] review I plan to have investigated the pre-college curriculum development activities in a broad sense, including MACOS particularly and also the program more generally. To do this, some procedural questions will be studied; for example, the distribution rights and royalty arrangements. In addition to a general survey of all of the curricula that have been developed, I shall have the review team make a detailed study of several cases as well as MACOS to see what they illustrate about the procedures that NSF has used in the support of curriculum development. The review will examine the following:
>
> (A) Curriculum Development Program
> (1) History
> (2) Case Studies
> a. Chemistry curriculum [CHEM Study], 1959-1969
> b. Science Curriculum Improvement Study, (SCIS) 1962-Present

"c. Man: A Course of Study (MACOS) 1963-1970
d. Comparing Political Experiences (CPE) 1972-Present
e. Individualized Science Instructional System (ISIS) 1972-Present

(B) NSF Distribution Policy and Royalty Arrangements
(1) History
(2) National Science Board Policy (1969)

(C) Curriculum Implementation Procedures
(1) History
(2) Research Studies Regarding Implementation
(3) Current Practices

(D) Evaluation Procedures for Establishing Content and Utilization

(E) Practices and Procedures in Science Curriculum Developed by Other Organizations

(F) Recommendations"

Also in his April 1, 1975, letter the Director committed the review team to have a report to him on May 14 and the National Science Board would review the findings at its meetings on May 15 and 16. Also, he wanted the review team to present the draft report to the Foundation's Advisory Committee for Science Education 1/ and the congressionally appointed ad hoc review group. The report was then to be released to the Chairman, House Committee on Science and Technology.

According to the Foundation's Director, the reporting dates for the review were established so that the Foundation

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1/ The Advisory Committee for Science Education provides advice and recommendations concerning education activities to the Director of the Foundation, through the Assistant Director for Science Education. The Committee consists of from 9 to 12 members who are appointed by the Director for 1-year terms and are normally not reappointed for more than 3 consecutive terms.

could stay ahead of the ad hoc review group's investigation enabling the Foundation to anticipate any problems. Also, since the Foundation would have to provide information regarding its curriculum development program to the ad hoc review group, the Foundation's review team could provide this information.

The review of five project grants to be used as case studies was rather comprehensive. An outline used to obtain common information on the five projects had eight broad topics, with subtopics under all but the first, as described below.

--Project description.

--Needs assessment (formal, informal).

--Proposal type (solicited, unsolicited).

--Manner of proposal review (external, internal) and award (internal).

--Monitoring of curriculum development (formal and informal devices, internal and external monitoring).

--Curriculum materials evaluation (characteristics and results of product evaluation).

--Curriculum distribution arrangements (description of publishing procedure, royalty income disposition, commercial potential).

--Curriculum implementation process (type of implementation activity; results).

The 11 members of the review team were designated about April 1. They included top management officials with various Foundation responsibilities who were not members of the education directorate under review. The members included:

--Assistant Director for National and International Programs (chairman of the review team).

--Director, Office of Planning and Resources Management (executive secretary of the review team).

--Director, Division of Biological and Medical Sciences.

--Deputy Director for Public Sector Productivity.

--Deputy General Counsel.

--Audit Officer.

--Budget Officer.

--A contract administrator.

--A program analyst.

In addition, two National Science Board members were included on the study team. The Foundation's Director advised us that Foundation employees were selected for the team because his self-imposed deadlines did not allow for the review to be done otherwise.

A team member with administrative responsibilities (such as program analysis, contracting, or budgeting) and one with operational responsibilities (such as a manager of a research program) were assigned to each of three case studies and two members with administrative responsibilities were assigned to each of the two remaining case studies. Four team members each had responsibility for two different case studies and three team members worked on one case study each. In addition, two of the three team members working on one case study each and one member working on two case studies were also responsible for helping prepare other portions of the report.

A resource person assigned to each case study was provided by the education directorate to assist review team members obtain needed resource material. Also, two consultants helped finalize the report with such services as organizing report material and providing editorial services.

The team members were provided with project grant folders (the official Foundation records) to obtain and analyze the data asked for in the outline discussed earlier. Other sources of data the team members used included science education reference material, such as guides for preparation of proposals and minutes of the Advisory Committee for Science Education meetings, and various materials obtained from the grantees who conducted the curriculum projects being reviewed or from the publisher of the projects' education materials.

The assigned workload was quite heavy considering the time allowed for completion and the voluminous grant folders to be reviewed and interpreted. At the time of the study, three of the projects had been active for over 12 years,

one project for about 4 years, and 1 for 3 years. 1/ For the two oldest projects, grant files from the program office alone for one project were about 1-1/2 feet thick and for the other project the files were about one foot thick. This did not include other material that could be reviewed, such as project newsletters and science education reference material.

The review team's work was expected to be completed by about April 24, 1975, with a draft report prepared for the May 9-10 presentation to the Advisory Committee for Science Education. Since the review team was formed about April 1, they had about 5 weeks to complete their detailed work and prepare their draft report on the assignment.

DIRECTION PROVIDED THE REVIEW TEAM WAS LIMITED

The written instructions for conducting the study were contained in (1) the Foundation Director's April 1, 1975, letter to the Chairman, House Committee on Science and Technology which outlines the scope of the review (see p. 24), (2) the Director's April 2, 1975, memorandum to the team's executive secretary which set the dates for completing the work and requested the team members to have their normal work handled by others in their office, and (3) an April 17, 1975, memorandum from the Director to the team's chairman which approved an expanded outline for the study and stressed the need for a thorough, rigorous, and objective study that would result in positive recommendations for improving the program's practices. In this respect the Director wrote:

> "A fully effective analysis of these issues is essential to honest examination of the integrity of our curriculum programs.
>
> "As you know, I am committed to reporting our conclusions to the Congress after appropriate discussions with the Advisory Committee for Science Education and the National Science Board. Your work is a crucial

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1/ The project time periods include planning grants or needs assessment grants that led to the project grant. They also include time when development work may have been completed, but the grant was held open to capture royalty income from the sale of the published materials.

"element in formulating this report. Let me urge you to require that in every respect that this study will be a model of objective and professional analysis.

"I urge you to make the full use of Foundation staff and the scientific community in carrying out this analysis. My remarks to you and the staff involved in this study at your first meeting indicate how important I feel this study is to the NSF. There is no issue before us of greater importance and I am confident that you will give it the attention that is needed."

The Foundation's Director advised us that he did not establish control points for feedback during the review. His management style was essentially to employ highly competent personnel and trust them to do an adequate job. Also, the Director expected that having National Science Board members on the team and having the team present its findings to the Advisory Committee for Science Education would provide adequate quality control. The Board members' involvement with the study was not extensive and apparently consisted of attending some team meetings and providing general comments on the team's findings during telephone conversations with the team's chairman or executive secretary.

QUALITY CONTROLS WERE INFORMAL

The Foundation's Director advised us that he probably talked to the team leaders about such things as the schedule for completing the review. However, he advised us he did not review report drafts or team meeting notes, and he was out of the country much of the time the draft report was being written. For example, from April 23, 1975, until May 4, 1975, he was in Egypt and Spain.

The review team's chairman advised us that he saw his responsibility as providing recommendations for the report and making major decisions on the report's preparation, while leaving the daily operation of the study to the team's executive secretary. The chairman was relatively new to the Foundation and advised us he was not familiar with Foundation policies and procedures or its staff. In this respect, he stated his approach was to listen and ask questions at review team meetings at which the team members discussed their findings. Also, as the review progressed he

discussed various findings with the team members to aid him in identifying the more significant problems that should be addressed in the report's recommendations. The chairman told us that he was not sure whether he saw any of the report drafts or the supporting documentation. However, he stated that if he had seen the report drafts, he would not have critically reviewed them. Team records show that some drafts were provided to him.

The team's executive secretary and the chairman said the executive secretary was responsible for assembling the report. The executive secretary was the only person involved in critically reviewing the draft case studies. Each case study team submitted its draft case study in outline form to the executive secretary about April 24, 1975, which apparently was accompanied by some of the background material (documentation) that the members considered in preparing the case study. The executive secretary advised us that he examined only those documents pertinent to points that seemed unclear or in need of further examination.

Apparently there were attempts at obtaining consistent results and crosschecking results by the team members. In addition to the outline described on p. 26, according to the executive secretary, it was decided to have each of the two team members assigned to a case study scan the total project record at the beginning of the study. This would have provided a crosscheck on the material prepared by the other team member. We interviewed the seven case study team members and found that their responses differed as to whether each reviewed all the grant file materials. Some advised us that they reviewed mainly those aspects of the grant that coincided with their day-to-day responsibilities within the Foundation (administrative and program responsibilities), and others advised us that while they did not review all material in the files, the case study team discussed different aspects of the grant among themselves.

Team meetings provided a means for team members to discuss their findings and could be considered as a quality control mechanism. The summary notes of the meetings show seven meetings were held in April and May and included discussion of such topics as how to proceed with the review and management problems uncovered by the review. Participants at various meetings included review team members, the chairman, the executive secretary, the

National Science Board team members, and education directorate personnel.

Our review of the case studies showed a lack of documentation standards, which apparently led to some of the statements being unsupported by written record or for which support could not be found. The reasons for those unsupported statements include using draft rather than final documents as sources, placing heavy reliance on secondary source material in lieu of readily available primary sources, and making assumptions that events occurred without attempting to verify if they did occur.

There was unsystematic and inadequate compiling of evidence to support the written case studies. The Foundation's Director requested that all review team records be placed in one location. We reviewed those materials and found they generally contained report drafts, copies of documents from the program files, science education reference material, and some review team organizational material such as outlines, schedules, and team meeting notes. With few exceptions, such as the Foundation's audit office workpapers for financial audit reports prepared for the five projects, the files were completely disorganized. Material contained in the files was loosely grouped by subject--such as a case study--but the person responsible for submitting the documents was often not identified. Also, the material was not organized and seemed to be thrown together in a bundle.

Because evidence used in writing the case study was not complete in the team files we had to ask team members for their general sources of documentation. There was little evidence that the case study authors prepared analyses or memorandums of discussion to support a fact or conclusion. There was also a lack of control in the draft review process. While some drafts were contained in the files, we could not be assured that we had all pertinent drafts or that drafts we had were complete. For some changes that were made to drafts involving management issues, the incomplete records prevented us from determining how, why, or when the changes were made, or who was responsible for the changes. These are discussed in chapter 4. These records did not show, and review team members could not tell us, why certain changes to drafts were made. We also found a lack of review to check the accuracy of the case studies. While the team's executive secretary advised us he reviewed documents for statements that that appeared contradictory or unclear, we found no evidence

that there was an independent check of factual or analytical case study statements to determine the accuracy or reasonableness of those statements.

CONCLUSIONS

In early 1975 the Foundation was apparently going through considerable turmoil due to congressional and public pressures resulting largely from its financial support of the controversial MACOS project. Although other investigations of the Foundation's precollege curriculum activities were underway, the Foundation's Director apparently wanted to be in a position to identify management problems and any solutions before they were reported by others. Self-evaluation by an agency of its activities is an appropriate and necessary function and therefore we do not take exception to the Director's decision. One could argue that the Foundation's review duplicated the efforts of the congressionally appointed ad hoc review group and our work. However, our effort at the time concerned only one project--MACOS--and was largely directed toward administrative aspects of the project, and the Foundation needed answers about its curriculum activities to respond to the ad hoc review group.

Although the Foundation's Director wanted the study to be "a model of objective and professional analysis," he did not provide for quality controls to insure the completeness, accuracy, and reproducibility of the study results. He apparently assumed that by providing top level staffing for the review, quality would result. The review team members had their own standards as to what constituted acceptable investigative techniques and adequate documentation to support a statement. Apparently the team's executive secretary was the only person formally reviewing case study drafts and his review of documentation was limited to points that seemed unclear or in need of further examination from his reading of case study drafts.

Documentation that was used by team members to support statements in the case studies was not systematically accumulated and preserved as workpapers to provide a ready reference for any questions about the case studies' content and to demonstrate the accuracy of the case studies. Case study drafts were reviewed very informally with no controls to insure that all questions raised concerning the drafts were answered and that their disposition was appropriate. Controls to fix responsibility for changes to case study

drafts--such as sign-off requirements--were not established, and the drafts themselves were not formally controlled--such as being numbered and dated.

We believe the lack of formal quality controls coupled with the ambitious effort and short time for completing the report led to the many inaccurate and unsupported statements as well as to the failure to detect some management problems, as discussed in chapter 2. The Foundation's review of its precollege curriculum activities resulted from the special circumstances at the time and helped improve Foundation practices and procedures. However, the Foundation, as the Nation's "science agency," would have been wise to have applied the principles of the scientific method 1/ during its review. The Foundation should consider the lessons learned from the review and insure that adequate quality controls are an integral part of future formal evaluations of its activities.

AGENCY COMMENTS

The Foundation's Acting Director agreed with our conclusion that more attention should have been paid to establishing appropriate standards and criteria in guiding the review team's effort. He also said that the experience gained will be valuable in any similar rapid analyses of Foundation policies and procedures in a given area. He concluded that the Foundation erred by not labeling the report as a "crash" study and as sufficient only for the limited purposes for which it was undertaken. We agree that program analyses should be qualified when appropriate.

1/ The principles and procedures for the systematic pursuit of knowledge involving recognition and formulation of a problem, the collection of data, and the formulation and testing of hypotheses.

CHAPTER 4

WHY WERE REVIEW TEAM FINDINGS OMITTED FROM THE REPORT?

Chapter 2 shows that the review team's case studies contain numerous problems with factual statements and omit mention of a number of management problems. We believe this resulted from a combination of a tight self-imposed deadline and heavy workload and the absence of effective quality controls. This chapter addresses whether there was an attempt to purposely delete or obfuscate the review team's findings to disguise the problem of how the Foundation staff had summarized the peer review comments in obtaining approval for the ISIS proposal. This is a primary reason we were requested to review the review team's preparation of the case studies.

SOME REVIEW TEAM FINDINGS DID NOT APPEAR IN THE PUBLISHED CASE STUDY

As described in chapters 2 and 3 the review team records were often incomplete. Specifically, draft case studies were sometimes incomplete and undated, and we could find no evidence of a sign-off procedure assigning accountability for changes made. Thus, we were forced to reconstruct the chronology of drafts and attempt to determine why changes were made to drafts and who made them, by interviewing officials responsible for preparing the report.

Our review of case study drafts and discussions with the team members who prepared them showed that only in the ISIS case study were changes involving management issues made to drafts which could not be reasonably accounted for. Because drafts of the ISIS case study were incomplete, we showed our reconstructed chronology of drafts to the case study author, who said that while our arrangement of drafts appeared to be in chronological order, the drafts might have been incomplete or included changes which were not made by him.

Following is a discussion of management issues that were either altered or deleted from drafts of the ISIS case study and team members' rationale for those changes.

Correct draft statement on peer reviewers' support of ISIS proposal incorrectly included in final report

The published case study states that all external reviewers recommended funding of the initial ISIS proposal (Vol. II, p. 105). Our January 1976 report on ISIS peer review representations shows that the Foundation's September 5, 1972, summary memorandum recommending support for the initial proposal incorrectly asserted that all 11 reviewers had recommended support when actually 3 of the 11 reviewers did not explicitly recommend support.

The earliest ISIS case study draft we located stated:

> "All reviewer's agreed that the development of the project was opportune, especially in view of the proposed flexibility of the curriculum and its modular structure. All reviewers recommended funding but none without raising questions on certain aspects of the proposal plan.* * *"

This draft, in outline form, was reviewed by the review team's executive secretary, who questioned whether all reviewers supported the project. The above excerpt is a near exact quotation from the September 5, 1972, education directorate program summary memorandum recommending support of the proposal.

The draft outlines were then to be rewritten into a narrative form. A subsequent draft which the case study author advised us he prepared deleted the opening word "all" and the hand written word "some" was inserted; also, the second sentence was lined out. This draft reads:

> "Some reviewers agreed the development of the project was opportune, especially in view of the proposed flexibility of the curriculum and its modular structure.* * *" (Underscoring supplied.)

A partial draft including the above changes typewritten was also found. However, the paragraph containing the sentence quoted above was crossed out. According to the case study author he believed the draft with the typewritten sentence beginning "some reviewers agreed" was the draft he prepared for the May 9-10 Advisory Committee for Science Education meeting.

A case study draft apparently used in presenting the review team's findings to the advisory committee and to the National Science Board 1/ makes no reference to whether "all" or "some" reviewers supported the proposal. The draft contains no statements on the results of the review, only a brief description of reviewer selection criteria and instructions to reviewers.

The next substantially different draft we were able to locate was the draft used by the editorial consultant to make editorial changes. The typed portions of the draft concerning proposal review, but not the remainder of the draft, were identical to the original draft section. This draft had the original typewritten passage quoted on page 35 that all reviewers agreed the development of the proposal was opportune and that all reviewers recommended funding. The editor made only minor handwritten changes which did not affect the substance of the material in this section. This section of the draft, with editorial and other handwritten changes, is identical to the proposal review section in the published case study.

The ISIS case study author said that in his initial draft he included the first quoted excerpt (see p. 35) before he had read the actual peer reviews. He apparently relied on the September 5, 1972, program summary memorandum since the draft's wording is nearly identical to that of the memorandum. According to the case study author, he then read the actual ISIS proposal peer reviews and in a subsequent draft changed the wording on reviewers' reactions from "all" to "some." The author advised us that he did not delete the section on "some reviewers" in the material presented to the advisory committee and to the Board and did not know who did. He advised us that during his participation in the advisory committee presentation he glanced at the case study casually and did not notice the section was deleted. We discussed the preparation of the case study with others, including the review team's chairman and its executive secretary and the two consultants

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1/ Draft material used in these two presentations was contained in loose leaf binders. We could not determine, and review team officials could not tell us, whether the binders contained drafts as presented to the advisory committee or as presented to the Board since the same binders were used for both presentations, but additional material was inserted for the later Board presentation.

who assisted in report preparation. They could not supply any information on why this error was included in the published case study.

Draft ISIS case study statement on peer reviewers' comments taken out of context was missing from final report

The published case study is silent on whether some peer reviewers' comments on the initial ISIS proposal were taken out context when quoted excerpts from the reviews were included in a September 5, 1972, program memorandum recommending support for the proposal. Our January 1976 report on the representation of ISIS peer reviews in that memorandum states that we do not believe that 5 of the 33 quoted excerpts accurately reflect the entire thought of the passages from which they were taken.

The earliest case study draft, in outline form, we were able to locate 1/ states:

> "In the staff proposal review recommendation letter from the Assistant Program Manager via the Program Manager to the Division Director (PES) [Division of Pre-College Education in Science], a number of reviewers comments are taken out of context and convey a meaning entirely different from that in the actual review. Negative reviewers comments are written as if they were positive. Also the recommendation before the NSB [National Science Board] contains statements attributable to reviewers which appear to misrepresent what the reviewers actually said."

In his review of the ISIS case study draft, the team's executive secretary noted that this was a serious charge and that he wanted to review the grant folders.

This paragraph appears in a partially revised draft in outline form prepared by the case study author, but

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1/ The case study author advised us he had not read all peer reviews before he prepared his first case study draft. He advised us that the other case study member had pointed out to him that a peer reviewer's comments were taken out of context. The other case study member corroborated this.

does not appear in a narrative draft the case study author believed he sent forward to be included in the advisory committee presentation. Since we could find only an incomplete copy of this latter draft, we could not determine if the paragraph was originally contained in it. The above quoted paragraph does not appear in the draft apparently presented to the advisory committee and to the Board, nor does it reappear in the published case study. According to the ISIS draft case study author, when he rewrote the draft he did not delete the paragraph and did not know who did.

The case study author said he mentioned the problem in a review team meeting. Notes of review team meetings shed no light on whether this issue was discussed during those meetings and, from our discussions with review team members, it was not clear whether the issue was discussed. The case study author also said he discussed the issue of peer review misrepresentations with the executive secretary, and showed him the summary memorandum recommending support for the proposal and the actual peer reviews. The case study author said this was done about the time the executive secretary reviewed the author's initial draft. The executive secretary said he did not examine the actual peer reviews until October 1975, after the report was published, and that he asked to see the ISIS grant folders but did not because of time pressures. He stated this was just one of many details to attend to before the report was published.

Case study statement on peer review comments misrepresented to the National Science Board

The first draft of the ISIS case study contains the following paragraph:

> "In the written material presented to the Natinal [sic] Science Board, reviewers, remarks concerning the original proposal are taken out of context and appear to be a misrepresentation of what the reviewers actually said."

When this draft was reviewed by the executive secretary, he noted in his comments that the above quote was a strong statement and that the author should be able to back it up with documentation. According to the team's executive secretary, during the final draft report review process and based on information supplied by an education directorate official, he changed the paragraph to read:

"In the written material presented to the National Science Board, reviewers remarks concerning the original proposal could appear to be taken out of context and appear to be a misrepresentation of what the reviewers actually said. This arises because the NSB writeup does not describe the negative comments, * * *[the proposer's] detailed rebuttal, and the meeting between ISIS and NSF staff that dealt adequately, in the staff's view, with reviewer criticism." (Changes made by the executive secretary are underscored.)

No statement regarding misrepresentation of peer reviews to the Board was contained in the drafts that were apparently presented to the advisory committee or to the Board, but the published case study did include the paragraph quoted above with only minor editorial changes.

The ISIS case study author said his original statement was based on his assumption that the September 5, 1972, program memorandum recommending support for the original proposal was presented as back-up to the material presented to the Board in 1972. He believed it was customary procedure to send material on peer reviewers' remarks to the Board. He said he did not, however, review Board files to determine what material concerning ISIS was actually forwarded to the Board.

Prior to the review team's report, the National Science Board had reviewed proposed ISIS awards twice--in 1972 and 1974. The Board's files contain no evidence that the September 5, 1972, memorandum accompanied those recommendations. Further, the 1972 recommendation and supporting material contain no mention of peer reviewers' comments. The 1974 recommendation and supporting material contain several positive statements on the results of the 1972 peer review but cite only one quoted excerpt from one reviewer.

The review team's executive secretary said he added the passage to the original excerpt because in his review of the 1974 Board package, he realized the package did not describe the interaction between the program staff and the proposer. He advised us that he did not believe he consulted with the case study author to determine if his perception of the problem coincided with the author's and that one of the consultants was to have checked changes in drafts with the resource persons and the case study

authors. The case study author told us that he did not remember if anyone showed him the added passage.

Draft ISIS problem statements were substantially revised

The "problems suggested by detailed review" presented on page 108 in the published case study differ significantly in form and in substance from the original draft version written by the case study author. The original version, a revised version by the case study author, and the final version published in the review team report are quoted below. The original draft version and the corresponding revised version of each problem statement, according to the case study author, are presented across from each other. According to the case study author, he deleted the problems discussed in the original draft version under numbers 2, 9, and 10 after it was decided in review team meetings that these were not necessarily problems. The case study author did not know why problem number 5 discussed in the original draft version was left out of the final report. He said he did not delete it and that it was apparently dropped from the report as a result of the rush to get the report rewritten in time to meet the team's commitments. He also said that when he revised his list of problems he added problem number 6 because he knew that verbatim peer review comments were provided to the proposer counter to Foundation policy at the time.

Comparison of Original, Revised, and Published ISIS "Problems Suggested by Detailed Review"

Original draft version	Revised and published versions 1/
"1. A needs assessment for the ISIS approach to high school science was never made. A single feasibility conference, in this case, appears to be a totally inadequate substitute for a needs assessment.	"1. What kinds of needs assessments should NSF require before embarking on long-term support for national curriculum development and implementation projects? Can the results of a single conference in certain instances serve as a needs assessment? (ISIS resulted from a single conference.)" [Underscoring added.]
"2. The Callaway Gardens conference proposal was handled in an unusually quick fashion by NSF. (An award was made in less than two weeks after the proposal was received.)	[Problem deleted as a result of discussions in review team meetings]

1/ The revised version by the case study author is the material that is not underscored. Underscored passages were added by the review team's executive secretary. Several minor editorial changes were also made not affecting the substance of the statements. The total material quoted represents the published version. Problems number 8 and 9 have been interchanged by us to correspond with original draft problem statements.

"3. Thirteen persons out of the 34 persons who attended the Callaway Gardens Conference were from the principal investigator's home institution (Florida State). Were the conference participants really representative of the broad spectrum of ideas for improving the high school science curriculum?	"2. What role should NSF play when supporting feasibility conferences to guarantee that conference participants are really representative of a broad spectrum of ideas for improving the school science curriculums?"
"4. The report of the Callaway Gardens Conference was not widely circulated before NSF entertained a proposal from the conference principal investigator based on the results of the conference.	"3. What should NSF policy be concerning dissemination of conference reports, especially in those instances where conference results are used as a main justification for NSF support of a national curriculum project? (The Callaway Gardens report had limited circulation.)" [Underscoring added.]
"5. Several of the ISIS Advisory Board members, later appointed by the project principal investigator, were attendees at the Callaway Gardens Conference.	[Problem deleted but reason unknown]
"6. It appears that none of the reviewers of the original ISIS proposal had available to them copies of the Callaway Gardens Conference report.	"4. what materials, other than the proposal itself, should be provided to NSF reviewers?"

"7. Because of the highly interdisciplinary nature of the ISIS proposal and the implications it held for change in the high school science curriculum on a national scale, a mail review evaluation process would seem to be wholly inadequate. Why wasn't a panel review considered?

"8. Reviewers raised some very serious concerns about several aspects of the ISIS proposal. Some of these concerns appear to be omitted in the PES program manager's summary statement on reviewers' concerns."

[Problem added when author revised problem set, see page 40.]

"5. Because of the highly interdisciplinary nature of the ISIS proposal and the implications it held for change in the high school science curriculum on a national scale, a mail review of the proposal would seem to be quite inadequate. What should the Foundation's policy be on proposal review systems <u>for curriculum development proposals</u>?" [Underscoring added.]

[Included in number 8 below]

"6. In what form and under what circumstances should reviewers' comments be transmitted to the proposer? (<u>Direct quotes of ISIS reviews were provided to proposer</u>.)" [Underscoring added.]

"9.	It appears that the PES program manager asked the ISIS principal investigator for reactions to reviewers comments before all reviewer comments were received at NSF.	[Problem deleted as a result of discussions in review team meetings]
"10.	There was apparently no feedback to reviewers by the PES program manager to determine whether their concerns had been met by the principal investigator's reactions.	[Problem deleted as a result of discussions in review team meetings]
"11.	In the ISIS award recommendation memo, the PES program manager in summarizing reviewers comments, appears to take them totally out of context--making negative comments sound as if they were positive by omitting certain key words or phrases from the actual text.	"7. What should the format be for grant recommendations by a program manager? (Negative reviewer comments were not discussed in as much detail as positive aspects.)" [Underscoring added.]

"12. Three minicourses planned for ISIS may be considered by some individuals to be sex education: Reproduction, Birth and Growth, and Human Sexuality. Human Sexuality is in a very primitive stage of development and is not yet available for use in the ISIS trial schools. The other two minicourses are in a trial stage and are currently available for use by the trial schools. The procedures for the development and use of these materials should be carefully monitored by NSF. The materials, in their present form, could generate a lot of controversy even though there is an explicit disclaimer included in the minicourse booklets of NSF approval or disapproval.

"9. Three minicourses planned for ISIS could be considered by some to be sex education: 'Reproduction,' 'Birth and 'Growth,' and 'Human Sexuality.'

"Human Sexuality' is in a very primitive stage of development and is not yet available for use in the ISIS trial schools. The other two minicourses are in a trial stage and are currently available for use by the trial schools. The procedures for the development and use of these materials should be carefully monitored by NSF. The materials, in their present form, could generate controversy even though there is an explicit disclaimer of NSF approval or disapproval included in the minicourse booklets. There is a clear need for NSF policy and procedures to ensure that areas where controversy might be expected are dealt with objectively and openly and that topics of possible concern in various localities are made evident without damaging the scientific integrity of the course material." [Underscoring added.]

"13. It appears that the National Science Board saw only positive reviewer comments or reviewers comments taken totally out of context. Format of materials presented to Board need to be such that all relevant factual information necessary for making an informed judgment be included. (Nothing should be swept under the rug.)

"14. The second ISIS proposal received only an in-house review before it was sent to the Board. The original reviewers comments, again taken out of context or distorted, were used as justification for continuing support for the ISIS project."

"8. What should the format be for making grant recommendations to the National Science Board? What should be included? What may be excluded? (ISIS materials provided to the NSB did not describe the details whereby the proposers responded to negative aspects of the reviews.)" [Underscoring added.]

[Included in number 8 above]

The original version of the problem statements prepared by the case study author as result of his detailed review were reviewed by the executive secretary; the revised set was included in the material apparently presented to the advisory committee and to the Board; and a final set which contained additional revisions by the executive secretary was included in the published case study.

According to the case study author, the executive secretary asked the author to rewrite the original problem statements to delete references to individuals. Both the case study author and the executive secretary said the case study author was not told to delete any of the problems or specifically told how to rewrite the problem statements. The case study author also said he was told by the executive secretary that some of the problems discussed in his original problem set would be handled administratively and would not be included in the report, but he was not aware of which ones would be handled this way.

The executive secretary advised us that no one individual gave instructions to delete references to individuals in drafts, that it was a review team consensus, and that all case study authors were instructed to revise the drafts. We found that while all case study drafts were revised, the ISIS case study was the only one in which the problems disclosed through the detailed review were substantially revised. 1/

The executive secretary said that as part of a final review of drafts, he found the ISIS case study author's revised write-up of problems disclosed by the review was not detailed enough to be understood, and that he had added the underscored passages on pages 41 to 46. He advised us that he did not believe that he consulted with the case study author to determine if his perception of the problems coincided with the author's, and that one of the consultants was to have checked changes in drafts with the resource persons and case study authors. The

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1/ The SCIS case study author advised us that he consolidated two of his original problems disclosed through the detailed review on SCIS peer review into one at the direction of the executive secretary. The purpose was to delete references to individuals. The executive secretary told us that he did not remember giving that instruction but did not rule out the possibility.

case study author advised us he could recall looking over a draft but did not remember at what time, at what stage the draft was in, or who showed it to him.

Supervisory reviews of case study drafts were limited

We reviewed all available drafts of case studies and found evidence of only one written supervisory review of case study drafts, which was made by the review team's executive secretary about April 27, 1975. While the April 28, 1975, team meeting notes stated that the chairman indicated he and the executive secretary had reviewed the drafts, the chairman advised us he could not remember specific details of that review. He advised us that he relied primarily on team member discussions for his information and that if he had read the draft case studies during the report's preparation, it would not have been a critical review. Review team records also show that the two National Science Board team members received some draft case studies. These included an ISIS case study draft which stated that the ISIS peer reviews were misrepresented both in the program memorandum recommending support for the project and when the recommendation was presented to the Board. Both Board members said they had only generally reviewed the material sent to them and were not aware of the ISIS peer review misrepresentations until our report was issued (January 1976). In our discussions with review team members, they were not consistent about whether the case studies had received a written review.

The executive secretary advised us that he wanted all issues he raised during his review addressed by case study authors, but not all were. He advised us he saw only typed drafts and did not see drafts with handwritten changes. He also stated that the ISIS case study problems were just several of many points that cropped up, that he did not verify the substance of the drafts or compare drafts for additions or deletions, and that he undoubtedly assumed later drafts were more correct versions than prior drafts.

FOUNDATION'S EFFORTS IN RESPONDING TO ALLEGATION OF ISIS PEER REVIEW COMMENT MISREPRESENTATION

As early as May 1975, the question of whether ISIS peer reviews were misrepresented was raised. Based on our discussions with top Foundation officials, the Foundation, in responding to congressional inquiries, apparently did not

choose to review the original peer review comments and compare them to a document summarizing them.

During May 1975, then Congressman John B. Conlan wrote four letters asking for information on the ISIS peer reviews and other matters. In one letter Congressman Conlan specifically asked for one peer review of the original ISIS proposal. In response to Congressman Conlan's request, the Foundation supplied much of the requested materials but refused to supply the review because it was solicited under an "implied promise of confidentiality." On May 12, 1975, Congressman Conlan issued a press release stating "* * *NSF officials have deliberately edited and misrepresented grant proposal evaluations from outside academic reviewers in order to push through funding of ISIS.* * *"

On May 16, 1975, the Chairman, Special Subcommittee on the National Science Foundation, Senate Committee on Labor and Public Welfare, wrote the Foundation's Director stating:

> "I am deeply disturbed by recent allegations that reviews of proposals submitted to the National Science Foundation by leading members of the scientific community may have been misrepresented by officials of the Foundation.
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> * * *
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> "I am * * * anxious to determine if there is any substance to allegations that the comments of peer reviewers have been misrepresented in the grant review process. On behalf of the Special Subcommittee, I am asking you to provide us with a full response to those allegations, and all documentation which bears any relevance to them. * * *"

The Foundation's May 23 response to the Chairman stated that it assumed his letter referred to Congressman Conlan's May 12 press release and briefly described aspects of the award decision process for the initial and subsequent ISIS awards. Attachments to the Foundation's response included a May 15 memorandum 1/ to the Foundation's Director from the review team's executive secretary.

1/ The executive secretary advised us that 2 or 3 days prior to the Chairman's letter, the Foundation was aware they would receive it, so the information was pulled together in anticipation of it.

Executive council 1/ minutes show that the review team's chairman and executive secretary were assigned to respond to the subcommittee chairman's letter. The team's chairman could not remember if he did in fact prepare the response, but believed he did not. The team's executive secretary advised us he prepared the response and that his perception of the problem was whether the peer review comments had been adequately handled (consideration of positive and negative review comments and interaction with the proposer) as opposed to whether they were accurately summarized in Foundation documents.

The response addresses the issue of whether peer review comments were adequately considered in the award decision process but not whether they were accurately summarized by program staff. The May 15 memorandum provided as an attachment notes that the peer review of the ISIS proposal was only part of the award decision process and outlines a portion of the staff review documented in a September 5, 1972, memorandum recommending support for the project. It also discusses the issue of whether peer review comments had been adequately considered, but does not address the issue of how accurately they are treated in the award decision process, specifically their summary in the September 5, 1972, memorandum recommending support for the proposal. 2/ According to the executive secretary, because the original peer review documents were located in the science education directorate offices across town and because the memorandum was prepared in a hurry, he relied on draft material the review team had prepared and telephone discussions with an education directorate official who provided general information and some documentation but did not read the actual peer reviews. Review team records show, as previously discussed, that the executive secretary had received, reviewed, and on April 27, 1975, commented on a draft ISIS case study in which the author stated that peer reviewers' remarks were taken out of context.

1/ The Executive Council functions as the key advisory body to the Foundation's Director on significant planning, policy, and problem areas, and consists of top management officials, including the Director and Deputy Director, within the Foundation.

2/ As described on pages 35 and 37, we have previously reported that the memorandum does not accurately or completely summarize some of the reviews.

Separate from the Foundation's review team report, administrative recommendations 1/ stemming from that review were sent by the Foundation's Director to the Foundation's assistant director for science education and to the assistant director for administration. The transmittal memorandum was dated June 5, 1975. The recommendations were not linked to the specific problems which gave rise to them. One of the recommendations was:

> "Reviewer's complete comments should be forwarded to at least the next level of management above the program manager for review prior to concurrence in the award recommendation. This is to ensure that reviewers comments are fairly and accurately summarized for NSF officials who will approve the recommendation."

The review team's executive secretary advised us he was responsible for compiling the administrative recommendations, and using his notes, one of the consultants prepared them. He believed the above recommendation was the result of the JSIS case study author's findings on questionable techniques used in summarizing peer reviewers' comments. He advised us that he presented the recommendations to the Foundation's Director, but that he did not recall detailed discussions with the Director about individual recommendations and did

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1/ According to both the review team's chairman and the executive secretary, they interpreted their responsibility as looking at broad policy and procedural issues (such as whether the directorate had external review procedures) rather than questions as to how well the procedure was carried out (such as whether all reviewers received pertinent proposal materials). The former question was to be addressed by the review team but the latter questions did not involve policy and therefore were not considered to be in the province of congressional or National Science Board oversight. Thus, they believed such points should not be included in the report but handled within the Foundation. While the review team's report did not contain these recommendations, volume I did note that the review team had identified many areas of administrative practice that could be improved and that they can and should be addressed satisfactorily through normal administrative action. Therefore, they were not discussed in detail in the report.

not believe the recommendation on forwarding peer reviewers' comments was specifically discussed. The Foundation's Director advised us that he believed he reviewed the recommendations with the executive secretary but could not remember whether he raised questions as to what specific problems gave rise to the recommendations.

Top Foundation management officials discussed Congressman Conlan's and the Senate subcommittee chairman's inquiries during Executive Council meetings on May 14 and 22, 1975. From our review of Executive Council minutes and back-up notes and from discussion with some persons who attended the meetings, we could find no indication that anyone present asked whether the charge of misrepresentation was true. Also, just prior to the transmittal of volume II of the review team's report, in testimony on the Foundation's peer review system on July 22, 1975, before the Subcommittee on Science, Research, and Technology, House Committee on Science and Technology, Congressman Conlan charged that some Foundation staff members had misrepresented peer review comments and had done so with the ISIS proposal. To document this charge he provided one quotation as an example. The reviewer who was quoted then testified that he did not believe the quotation misrepresented his position, but it did not summarize it very carefully.

The executive secretary advised us that in October 1975, after we had been requested by the Chairman, House Subcommittee on Science, Research, and Technology to review ISIS peer review representations, he read the actual peer reviews and discovered the review team's report was in error. He said he raised this issue with the review team chairman and asked if the chairman would report this to the Foundation's Director. The review team chairman acknowledged that the executive secretary advised him of questionable matters regarding the ISIS peer reviewer comments but believed that the questions were essentially matters of interpretation and judgment. He advised us he did not believe he was being asked to do anything since he had been dissociated from review team activities since mid-May.

The executive secretary also said he discussed the issue with the acting assistant director for science education and believed the assistant director indicated that he was aware of the problem. The executive secretary did not recall whether he asked if or the acting assistant director indicated that he would bring the finding to others' attention. However, the assistant director advised us he (1) discovered the error on his own shortly after being appointed acting

assistant director 1/, and (2) brought it to the attention of the executive secretary and the head of the congressional liasion office assuming one of the two would take appropriate action. We advised the executive secretary of the assistant director's statement, but the executive secretary did not wish to change his position. The head of the congressional liasion office advised us that while she could not remember the specific conversation she was aware that around October 1975 the assistant director had advised her of management problems with ISIS and other curriculum projects. She believed the assistant director did not specifically refer to ISIS peer review representations and believed that the purpose of the conversation was to keep her informed as head of the congressional liasion office in case problems arose in the future.

The Foundation's Director said the question of whether peer reviews were actually misrepresented was never asked during this time. He stated he was more concerned with positive management changes that were to take place as a result of the review team's efforts than possible problems that might have existed. Also, he believed the relevant question was access to peer review comments which the Foundation considered to be gathered under an implied promise of confidentiality and not whether certain peer reviiw comments were misrepresented.

According to the Director, he did not find out that the peer reviews were misrepresented until he read our January 1976 report on ISIS peer review representations.

CONCLUSIONS

Of the five case studies included in the review team's report, changes which we could not reasonably account for involving management issues were made only in ISIS. After examining review team records, which were incomplete, and after discussions with review team members, consultants, and others, we cannot conclusively determine why:

--A section in a draft case study pertaining to reviewers' reaction to the initial ISIS proposal was included in early drafts, was not included in a subsequent version of the case study apparently presented to the science education advisory committee and to the National

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1/ Appointed September 1975.

Science Board, but reappeared in the published case study without the following two original findings.

1. A statement quantifying reviewers' support of the initial ISIS proposal, although correct as included in a draft, was incorrect as included in the published case study.

2. A statement in a draft case study justifiably criticizing the Foundation's summarizing of peer review comments in a September 5, 1972, staff memorandum recommending support for the initial proposal--negative comments were made to appear positive--was not included in the published case study.

The statement by the case study author regarding misrepresenting ISIS peer review comments to the National Science Board was based on his erroneous assumption that the September 5, 1972, program summary memorandum was included in the recommendation package sent to the Board. The executive secretary's additions to the case study author's statements, according to him, were based on the actual package that the Board saw in 1974. They do not, however, reflect the findings as perceived by the case study author.

The published version of the problem statements in the ISIS case study, in many cases, does not disclose the nature of the problems as contained in the early draft case study prepared by the case study author. Both the author and the executive secretary said the re-write was done to delete references to individuals. However, the re-write goes beyond the mere deletion of personal references.

Questions have been raised concerning whether there was a deliberate attempt within the Foundation to conceal review team findings concerning the Foundation's summarizing of peer review comments on the initial ISIS proposal. Considering that top-level Foundation staff were involved, the above events suggest a degree of carelessness in preparing and reviewing the draft ISIS case study which could possibly lead to the conclusion that the problems regarding the ISIS peer reviewer comments were deliberately withheld from disclosure to the public. However, considering the review was made and the report was prepared on a "crash basis" without formal quality controls it is also possible that the ISIS findings might have been inadvertently dropped from the case study. Sufficient evidence was not available for us to decide.

Related to the questions concerning the treatment of ISIS peer review comments in the review team's report is whether the Foundation's top management took adequate action to determine whether the ISIS peer reviews were, in fact, misrepresented once the question was raised by Members of Congress. From May 1975 until October 1975, when we were asked to review the completeness and accuracy of a summary of ISIS peer reviews, the Foundation was frequently confronted with the question of whether ISIS peer reviews were misrepresented. Based on the information provided to us by Foundation officials concerned with the problem, the Foundation did not attempt to determine if the charges were true--despite ongoing congressional interest in the Foundation's precollege curriculum activities and the fact that source documents (peer reviews and the document summarizing them) were readily available.

Also, after completion of volume II of the review team's report, which contained the case studies (about July 1975), but before we issued our January 1976 report concerning ISIS peer reviews, several top Foundation officials learned the review team's report was in error concerning the ISIS peer reviews. Apparently, none of these officials chose to inform the Foundation's Director. We believe the Foundation was negligent in responding to congressional concerns over the ISIS peer review questions because, according to its officials, readily available source documents were not examined to determine the validity of the allegation that ISIS peer review comments had been misrepresented.

AGENCY COMMENTS

Neither the Foundation's Acting Director nor its former Director commented on matters discussed in this chapter.

CHAPTER 5

SCOPE OF REVIEW

Our review concerned (1) why any inaccuracies or omissions of management problems might have occurred in the case studies of Foundation-supported precollege science curriculum projects (app. IV and synopses (vol. I)) of the National Science Foundation's May 1975 precollege Science Curriculum Review Team's report and (2) if further strengthening of Foundation policies and procedures in its precollege curriculum development program was needed because of management problems that might not have been disclosed by the review team.

The primary periods covered by our review were April to July 1975, during which time the Foundation's review was initiated and the final report was transmitted to the Chairman, House Committee on Science and Technology, and 1959 to July 1975 which is the time from the planning activities of the earliest of the five projects to the time the Foundation transmitted its report to the Committee.

In our review, we:

--Examined the project and administrative records for the five curriculum development grants and project files for grants which were used as needs assessments for the projects.

--Examined the review team's records. These included team meeting notes, drafts of case studies, team schedules, and documentation submitted by team members in preparing the report.

--Reviewed recent studies on the Foundation's precollege curriculum development activities for discussion of management problems and recommendations made. See page 21.

--Examined Executive Council minutes and supporting documentation for the period May-July 1975 for discussion of the ISIS peer review issue.

--Interviewed the review team members who prepared the report's case studies. Each official was interviewed to determine the materials used in preparing the case study, the instructions given to the team, and the

procedures used to prepare the case study. After we reviewed the case study for accuracy and discussion of management problems, the case study authors were interviewed for their reactions to our preliminary findings.

--Interviewed other Foundation officials responsible for the review team report. These included the Foundation's Director, the Chairman and Executive Secretary of the review team, and two consultants to the review team. The two National Science Board members working with the review team were contacted to determine their roles on the team.

--Interviewed other Foundation officials including some Executive Council members, other persons attending Council meetings, and others who advised us they had information to contribute concerning our review. Matters discussed included possible purposeful deletion of management issues from the review team report, and the Foundation's responses to congressional inquiries relating to ISIS.

--Reviewed the transcripts of the May 9-10, 1975, Advisory Committee for Science Education meeting; and reviewed printed records and/or transcripts of congressional hearings for the Foundation's fiscal year 1977 authorization and appropriations requested and special oversight hearings on peer review in which review team activities were discussed.

Our review was conducted at the National Science Foundation headquarters in Washington, D.C.

DESCRIPTION OF THE FIVE PRECOLLEGE SCIENCE CURRICULUM PROJECTS USED AS CASE STUDIES BY THE FOUNDATION'S REVIEW TEAM

CHEMICAL EDUCATION MATERIALS STUDY

On April 1, 1960, the Foundation awarded a grant to the University of California (Berkeley) to start the CHEM Study project. The objectives of the project were to (1) encourage teachers to continue studying chemistry in order to keep abreast of scientific advances and thus enable them to improve their teaching methods, (2) diminish the gap in understanding between teachers and scientists, (3) stimulate and prepare high school students who planned to continue studying chemistry after high school, and (4) increase the understanding of the importance of science as it applies to current and future human affairs of those students who will not continue studying chemistry. CHEM Study intended to accomplish these objectives by preparing new teaching materials, including texts and films, for a high school chemistry course.

The CHEM Study grant grew out of several conferences in the late 1950s which perceived needed changes in chemistry instruction at the high school level. One of these conferences was held December 14-15, 1958, between Foundation and American Chemical Society representatives to determine the reasonableness of organizing a study concerning the problems of teaching chemistry. The Society representatives decided such a study was desirable.

As a result of the December 1958 conference, Ohio State University submitted a proposal and the Foundation supported a grant in 1959 to plan an actual chemistry curriculum revision. This was the "Interim Planning Committee for Chemistry Course Content Studies of High School and General College Chemistry." As a result of the interim planning committee's work, the University of California (Berkeley) submitted a proposal to organize a chemistry curriculum revision. The Foundation supported this activity as the "Preliminary Conference of the Steering Committee of the Proposed Chemical Education Materials Study" in 1960. The proposal for the actual CHEM Study project followed shortly.

The materials produced by the CHEM Study project, according to a grantee publication, include a text, a teacher's guide, a laboratory manual, 2 program sequences on mathematical skills, achievement tests, 27 films for classroom use, and 17 teacher training films. The CHEM Study approach

is based largely on laboratory experiments which give students the opportunity to observe chemical phenomena that would be useful in learning chemistry principles. Another aspect is that tests are designed specifically for the curriculum. These tests were meant to allow the student to apply concepts and experimental data to situations that were similar but not identical to situations encountered in the course.

From 1960 to 1972 Foundation funds awarded for the curriculum development totaled $3.2 million of which $500,000 was returned to the Foundation. In addition, $11,500 was awarded for the interim planning committee grant and $9,775 was awarded for the steering committee grant. Also, according to Foundation officials, from fiscal years 1961 through 1975 the Foundation awarded about $4.6 million to various grantees to implement the CHEM Study curriculum.

The CHEM Study text was marketed in 1963; however, the grant was held open until December 31, 1972, because of income from the sale of publications. The original text was distributed commercially by W. H. Freeman and Company. Revised texts were sold by D. C. Heath and Company, Houghton Mifflin Company, and Prentice-Hall, Inc.

SCIENCE CURRICULUM IMPROVEMENT STUDY

In 1962 the Foundation funded a University of Maryland proposal to study grade school science teaching. The proposal stated that elementary science curriculums of the day did not have continuity of presentation and did not demonstrate the unity of science. It proposed to study the development of an adequate teaching program for elementary schools through grade eight and the development of a training program for science teachers of pre-high school students.

A proposal to continue the project was submitted in 1963 by the same researcher through the University of California (Berkeley). The proposal was funded in September 1963 with the emphasis changed from research to development of a comprehensive science curriculum for kindergarten through grade three. The SCIS project was subsequently expanded to the development of a kindergarten through grade six curriculum. Material for grades one through six was published in 1970-1972 and the kindergarten material was published in 1974. Including the original grant at the University of Maryland, the Foundation provided about $4.3 million for the support of the SCIS project. According to Foundation

officials, the Foundation has also awarded about $6.7 million from fiscal years 1966 through 1975 to various grantees for SCIS implementation activities.

The object of the curriculum is to teach children science concepts such as the properties of materials, ways in which material objects interact, and ecosystem concepts. The SCIS concepts are taught through sequential units which involve students in direct observation and experimentation.

SCIS is composed of 13 units--1 for kindergarten, and 1 physical science and 1 life science unit for each grade one through six. SCIS materials include kits containing teaching materials such as teacher guides, student manuals, scientific supplies, and apparatus. Films and evaluation supplements were also produced. SCIS is published by Rand McNally and Company.

COMPARING POLITICAL EXPERIENCES

As a result of the findings of the American Political Science Association's Committee on Pre-Collegiate Education, the Association submitted a proposal to the Foundation in September 1971 for the development of new elementary and secondary school level instructional materials in government and politics. The Association's committee examined materials currently in use; sent questionnaires to political scientists; reviewed research in education and political socialization; surveyed high school students; and consulted with teachers, students, and curriculum specialists. They found that the treatment of a person's political life in most traditional social studies textbooks was inadequate and that alternative instructional materials for teachers and students were needed to supplement or replace existing curriculum materials.

The Foundation first supported the CPE project in 1972. The project was divided into elementary and high school parts. The elementary portion was to study political science education in elementary schools--kindergarten through grade six--and then develop guidelines for new instructional materials. The approach was to focus the materials on the children's natural political life within the contexts of family, school, and peer groups. The intent of the high school portion (two semesters, usually at grade 12) was to design instructional materials to allow students to think about broad political issues in an interdisciplinary manner. These materials were to encourage students to compare their experiences and observations in schools with other political systems. The

materials were to emphasize understanding in communication, leadership, ideology, decisionmaking, influence, and participation.

According to a Foundation official, the elementary portion was subsequently discontinued, due in part to negative reviews of a renewal proposal. The planned high school portion will contain four interrelated components:

1. A conceptual framework which will serve as a basis for the explanation of political experiences.

2. Analytic tools that promote systematic social science inquiry.

3. Activities that utilize the school system as a laboratory for gathering data, applying skills, and participatory experience.

4. Instructional strategies to provide for teacher flexibility and student choice of topics.

According to a Foundation official, the materials will include student materials, teacher's guides, inservice teacher training materials, and suppporting materials (such as transparencies and filmstrips). Development work is expected to be completed in 1977. Prentice-Hall has been selected as the publisher for CPE materials, but a Foundation official advised us the publishing contract had not been signed as of December 1976.

As of December 1976, the Foundation had provided about $1.5 million support for CPE, primarily for the high school portion, and does not anticipate further awards to the project. Also, according to Foundation officials, about $57,000 was awarded in fiscal year 1975 to various grantees for CPE implementation activities.

MAN: A COURSE OF STUDY

MACOS is a social studies curriculum generally to be used by fifth grade students. The idea for MACOS grew out of a (1) 1962 non-Foundation-supported conference whose purpose was to explore the possibility of an integrated social science and humanities program and (2) subsequent review of social science films by the two conference organizers--the Education Development Center 1/ and the American Council of Learned Societies.

1/Formerly Educational Services Incorporated.

To help correct deficiencies in the social science area perceived by these activities, the Education Development Center submitted four proposals to develop a series of anthropology films. The Foundation provided support for two of the proposals totaling about $195,000 but could not act in time to support the other two. The Foundation suggested that the four proposals be consolidated into a single proposal covering the total social science program. In May 1963 the Education Development Center submitted a consolidated proposal for developing a social science and humanities curriculum for grades one through six. Proposed work was subsequently expanded to include kindergarten and grades 7 through 12. The elementary portion evolved into MACOS, the junior high school portion was not funded by the Foundation, and the high school level was not completed.

MACOS, as published, uses studies of selected animal groups and a primitive human society--the Netsilik Eskimos--to explore the roots of human social behavior. According to the Education Development Center, MACOS emphasizes the biological continuity between animals and humans and the distinctiveness and diversity of the human cultural heritage.

MACOS was published in 1970 by Curriculum Development Associates, Inc., a commercial publisher. Course materials include films, filmstrips, slides, records, booklets, charts, games, and displays.

Including the two film production grants, funds awarded to the Education Development Center total about $4.8 million. In addition, according to Foundation officials, the Foundation has awarded about $2.3 million from fiscal years 1967-1975 in MACOS curriculum implementation grants to various grantees and about $348,000 for curriculum evaluation activities.

INDIVIDUALIZED SCIENCE INSTRUCTIONAL SYSTEM

The ISIS project is intended to develop a flexible, interdisciplinary curriculum that will facilitate individualization of science instruction at the high school level (grades 10-12). The curriculum, which is still being developed, is to consist of about 65 short, essentially independent modules, or minicourses, which deal with a specific concept from biology, chemistry, and physics but are presented in an interdisciplinary manner. Topics dealing with the social implications of science and technology are also to be included in the curriculum. In addition, each module provides options which permit the student to probe into more complex aspects

of the topic. ISIS is being designed to allow teachers and students maximum flexibility in selecting any number of minicourses for instruction in a particular field or area of science and allow students to progress according to their own needs and abilities.

The Foundation received a proposal from Florida State University to support a conference to discuss the problems of building a multiyear, multidisciplinary high school science program. The proposal was prompted by concerns of some educators that (1) science teaching is generally group centered and teacher directed, (2) few provisions are made for the individual student's learning rate and interest, (3) most science courses are oriented for college-bound students and emphasize theoretical rather than applied science, and (4) there is little correlation between the biology, chemistry, and physics courses taught in grades 10-12. The proposal resulted in the Foundation supporting the October 1971 Callaway Gardens (Georgia) conference, which, among other things, concluded there was a need to (1) focus upon a more flexible and individualized instructional program, (2) strike a balance between theoretical and applied science, and (3) stress the social implications of science.

Following the conference, Florida State University submitted a February 1972 proposal to the Foundation to fulfill the perceived needs. The Foundation provided initial support in September 1972 and development activities have continued to the present. According to a Foundation official, the expected completion date for minicourse development is September 1979 and September 1980 for the instructional management materials. As of December 1976 the Foundation has awarded about $4.1 million, and estimates a total cost of about $6.4 million. In addition, according to Foundation officials, the Foundation has awarded about $158,000 in fiscal years 1974 and 1975 to various grantees for ISIS implementation activities.

The materials are being published by Ginn and Company. According to a Foundation official, 15 minicourses are currently on the market. ISIS materials are to include student booklets, teachers' guides, minicourse tests, instructional games, audiotapes, and specially developed apparatus.

EXAMPLES OF MAJOR FOUNDATION ACTIONS TO IMPROVE ITS CURRICULUM ACTIVITIES

MORE FORMAL NEEDS ASSESSMENT

The need for a more formal needs assessment was addressed by the Foundation's review team, the Advisory Committee for Science Education 1/, the ad hoc curriculum review group, and our report on the MACOS project.

To respond to these recommendations, the Foundation's Assistant Director for Science Education, in testimony before the House Subcommittee on Science, Research, and Technology, House Committee on Science and Technology, on February 10, 1976, stated that:

--No new major curriculum projects will be funded without a systematic needs assessment. These assessment will take two forms: (1) analytical surveys and analysis of educational practices and requirements and (2) public participation and comment on program designs.

--A prototype approach will be used. Several small awards will be made, and some products will be produced for further evaluation. Awards will be made through formal competitive procedures such as program solicitations.

--Clear "go" and "no-go" decision points will be established so that large investments will receive an explicit progress review.

--Independent evaluation procedures will be established to review a project's progress throughout its life.

Concerning needs assessment, the Foundation has awarded three contracts to study current precollege science education practices, it has sponsored a review of its precollege curriculum projects by outside panelists, and will use the newly established Research in Science Education program as input for its long-range program for curriculum development activities.

1/See footnote, p. 25, for a description of the advisory committee.

IMPROVED PEER REVIEW AND
AWARD DECISION PROCEDURES

Four of the reports pointed out that the Foundation needed to improve administration of its peer review system. Those improvements included wider participation of potential users--such as teachers and parents--as reviewers, improved documentation for the selection of reviewers and the disposition of their review comments, and methods to make certain that peer review comments were accurately summarized when presented to higher level management.

The Foundation has modified and tightened its peer review process. The changes include:

--Unsigned, but verbatim, peer review comments are available to the principal investigator upon request.

--Complete copies of peer review comments are to be sent to the National Science Board's Programs Committee when board action on a proposal is necessary.

--Detailed guidelines for selecting reviewers to insure broad representation of views and affiliations, as well as the avoidance of appearance of conflicts of interest, have been issued.

A major change has been the establishment of an action review board in the education directorate (and similar boards in the other five program directorates). The board is composed of education directorate officials, as well as representatives from other concerned Foundation offices, such as the Office of the General Counsel and the Grants and Contracts Office. The board is to insure that:

--Proposals recommended for award or declination have been appropriately reviewed and evaluated for quality, utility, cost, and conformity to program objectives.

--All recommended grant actions are adequately justified and documented.

--Significant policy issues and administrative questions have been delineated and resolved.

--Public documents are understandable to lay persons.

To do this, board members review, for accuracy and justification, both original and summary documents relating to peer reviews and other program matters.

In addition, the Foundation Director's action review board will review and recommend to the Director the disposition of proposals forwarded to him for submission to the National Science Board. The board consists of the Foundation's deputy director (chairman), general counsel, assistant director for administration, and the Foundation Director's special assistant. Assistant and Deputy Assistant Directors from the Foundation's directorates may be selected by the board's chairman to serve as rotating members.

A special committee of the National Science Board is to monitor the performance of these action review boards and meet with the directorate heads to consider progress and problems with the action review boards. The Board has also requested the Foundation's Director to submit for Board approval all recommendations for further funding of on-going curriculum development projects and the initiation of new projects.

DOCUMENTING CHANGES TO PROPOSALS AND TO APPROVED OBJECTIVES

In some of the projects we reviewed, various nonbudget aspects of proposals were apparently revised (such as scope of effort) based on Foundation staff and/or peer review and, in some cases, substantial changes in direction or scope of the project were apparently made during the development work. Our review of the files showed that, in some cases, the apparent changes were not documented in the files although subsequent events indicated these changes had been agreed upon. In other instances, a revised proposal or other documentation showed that the changes had been agreed upon. To insure that the objectives of a project are evident and that progess toward these objectives and results achieved can be measured, any agreed-upon changes to the proposal plan or to the activities under the grant should be documented in the files. A Foundation bulletin, issued in April 1976, requires that any significant change to a proposal affecting scope, objective, or methodology must be documented in the grant files with letters of concurrence from the principal investigator and the grantee institution. Less significant changes are to be noted in the grant files but do not require written confirmation.

IMPROVED PROJECT MONITORING

The Foundation's philosophy toward monitoring has traditionally been a "hands-off" approach to allow grantees maximum freedom in carrying out their activities. The Foundation's review team, the ad hoc review group, and we recognized the need for more active and systematic monitoring with which the Foundation substantially agreed. In December 1976 the education directorate issued a circular establishing project monitoring policies and procedures.

MATERIALS EVALUATION

The Advisory Committee for Science Education, the review team, the ad hoc review group (minority report), and we pointed out that the Foundation needs to emphasize evaluation of materials produced with its support. Evaluation is the principal way the Foundation, materials' developers, school officials, and other users can determine the materials' worthiness in improving science education. The Foundation agreed with the substance of the recommendations and has issued guidelines to establish policy and procedures for materials' evaluations.

As one step in evaluating materials, the Foundation sponsored a review of 19 curriculum development projects by 73 panelists with differing backgrounds and affiliations. As a result of this review, three projects were to be continued substantially as planned, three would be slowed down and the project's scope reduced, and five would not be continued. The remaining eight were mostly completed at the time of the review.

DISTRIBUTION EFFORTS

Once materials developed with Foundation support are completed, the Foundation generally relies on commercial publishers to distribute them. The review team recommended that a research program be developed to explore barriers to the distribution of science education curriculum materials. In October 1976 we noted that many of the projects we reviewed had marketing problems, such as being too costly or too innovative. We made several recommendations aimed at involving potential users and commercial publishing representatives early in a project to identify potential barriers to the use of the materials being developed.

APPENDIX II

The Foundation, in its newly established Research in Science Education program, will address the question of barriers to the distribution of materials. The Foundation has agreed to require proposers to identify existing materials, their strengths and weaknesses, intended users, and anticipated barriers. Also ways to solicit publishers' views on proposals to develop education materials without creating conflict of interest problems will be investigated, and views of users will be obtained for ongoing and future projects.

CONTRACTUAL ARRANGEMENTS

Various recommendations were made by the review team in its report and in administrative recommendations, by the ad hoc review group, and by us to strengthen the Foundation's requirements for oversight of financial and contractual matters associated with the projects it supports. These include more clearly defined policies for fees, royalty income rights, and other business arrangements; and review and approval of contracts and other agreements for marketing educational materials.

In January 1976 the Foundation issued a management circular establishing guidelines, procedures, and responsibilities for the development, submission, review, and approval of publication plans, contracts, and other agreements. This circular supplements the Foundation's February 1969 "Statement of Policies for the Distribution of Publications and Other Materials Developed Under the Science Education Programs of the National Science Foundation," and its 1973 grant administration manual, which outlines basic principles in this area.

IMPLEMENTATION ACTIVITIES

The Foundation's review team, the ad hoc review group, and our report on MACOS addressed both general topics and administrative issues regarding curriculum implementation activities. For fiscal year 1976, Congress curtailed these activities. The Foundation has now discontinued its program that assists teachers and administrators in adopting or using Foundation-funded or non-Foundation-funded curriculums and has no plans to request further funding for these types of activities. Accordingly, the Foundation's responses to recent reports' recommendations will not be described.

NATIONAL SCIENCE FOUNDATION
WASHINGTON D.C. 20550

March 3, 1977

OFFICE OF THE DIRECTOR

Mr. Gregory J. Ahart
Director
Human Resources Division
General Accounting Office
Washington, D.C. 20548

Dear Mr. Ahart:

This is in response to your request of January 27, 1977, for comments on the draft GAO report to the House Subcommittee on Science, Research and Technology concerning the preparation of the May 1975 report of the National Science Foundation Science Curriculum Review Team.

I have asked each member of the NSF Science Curriculum Review Team to review the draft GAO report and have considered their responses. I believe the individual members of the NSF Review Team made a conscientious effort under severe constraints of time and resources. They produced a thoughtful and wide-ranging study of management issues. As the draft GAO report points out, the study identified major policy problems in the science curriculum area and made sound recommendations. The fact that these conclusions and recommendations are consistent with those of later, more detailed studies testifies to the thoroughness and dedication of the members of the Review Team.

While it is doubtful that the policy and procedural conclusions and recommendations would have differed much in any event, I believe that NSF should have designed a better "crash" study and used the Review Team members more effectively. It is obvious to me from review of the GAO report and the responses of the team members that there were serious failings in the system employed by NSF management in designing, synthesizing, and reviewing the work of individual team members. The draft GAO report correctly points out that greater attention should have been paid to the establishment of appropriate standards and criteria to guide this effort.

APPENDIX III

Page Two

Clearly "crash" studies should be labeled as such and held out as sufficient only for the limited purposes for which they are undertaken. There is no question that NSF management committed an error in judgment by not so qualifying the Review Team report. The Foundation is properly held accountable for this error, and the GAO report has served a useful purpose in identifying the deficiencies of this study. The experience gained will be valuable should we again require similar rapid analyses of NSF policies and procedures in a given area.

Sincerely yours,

R. C. Atkinson

Richard C. Atkinson
Acting Director

APPENDIX IV

H. GUYFORD STEVER
1528 33RD STREET N.W.
WASHINGTON, D. C. 20007

March 4, 1977

Mr. Gregory J. Ahart
Director, Human Resources Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Ahart:

Thank you very much for showing me a copy of a draft of the General Accounting Office Report entitled, "Curriculum Case Studies Are of Questionable Quality but Helped Foster Improvements in the National Science Foundation's Pre-College Curriculum Activities".

It is gratifying to note that your GAO report contains no recommendations for action beyond those already taken by the National Science Foundation. Although you conclude that the Case Studies were of questionable quality, I believe that the GAO study does not give sufficient credit to the report of the Curriculum Development Review Team for it played the major role in the initiation of the series of corrective management and personnel changes to improve the handling of grant proposals, not only in the Curriculum Improvement area, but also in all the NSF program areas. These changes of management practice, peer review, and personnel have now been used in the handling of tens of thousands of grant proposals.

The GAO report deals with one aspect of the problem facing the Foundation in the Curriculum Development Program but the larger issue in the minds of those objecting to the program was that relating to the value judgments made by the NSF Staff, the Board, and the Peer Reviewers concerning what should be taught to pre-college students, especially in the social sciences. This was the problem occupying most of the attention of the concerned Foundation officials, following the issuance of the Review Team's report which was at the time relied on for the recommendations of administrative change. This other aspect of the problem was dealt with in part by having a "de novo" review of all the still active Curriculum Development projects, in part by personnel changes, and in part by the institution of management and procedural changes, such as the forming and use of the Action Review Boards. Thus the two principal preoccupations of the concerned officials during the summer of 1975 were to handle this other major problem in Curriculum Development and to institute the changes mentioned above. This focus of attention may account for the poor performance in reviewing one more time the material of the Review Team's report.

APPENDIX IV

It is also gratifying that, although the GAO report deals in detail with the shortcomings of the Report of the Curriculum Development Review Team, there were no substantial new findings beyond those reported to the Director and the Board by the new Assistant Director for Science Education in his review requested by the Director following the release of the earlier GAO report. The findings of this later NSF review were reported in the 1976 Spring Hearings of the Appropriation and Authorization Committees of the Congress that were responsible for the Foundation.

Thank you again.

Sincerely yours,

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